PHYSICS

BOOKS - MARVEL PHYSICS (HINGLISH)

ATOMS, MOLECULES AND NUCLEI

Mcqs

1. According to classical electromagnetic theory, the electron in an atom will move along a

A. Straight line

B. Circular path

C. Parabolic path

D. Spiral path

Answer: D

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2. Define the distance of closest approach. An α-particle of kinetic enegy $'K'$ is bombarded on a thin gold foil. The distance of the closest approach is $'r'$. What will be the distance of closest approach for an α-particle of double the kinetic energy ?

A. $\frac{r_0}{2}$

B. $2r_0$

C. r

D. r_0^2

Answer: A

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3. An alpha nucleus of energy $\frac{1}{2}m\nu^2$ bombards a heavy nucleus of charge Ze . Then the distance of closed approach for the alpha nucleus will be proportional to

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

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

C. v^2

D. $\frac{1}{e^2}$

Answer: B

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4. In a Rutherford scattering experiment when a projectile of change Z_1 and mass M_1 approaches s target nucleus of change Z_2 and mass M_2, te distance of closed approach is r_0. The energy of the projectile is

A. Directly proportional to $M_1 \times M_2$

B. Inversely proportional to $M_1 M_2$

C. Directly proportional to $Z_1 Z_2$

D. Inversely proportional to $Z_1 Z_2$

Answer: C

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5. In Rutherford's scattering experiment , 60 particles were scattered per min for $\theta_1 = 90^\circ$. How many particles will be scattered per min for $\theta_2 = 60^\circ$?

A. 60

B. 120

C. 180

D. 240

Answer: D

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6. A beam of fast moving alpha particles was directed towards a thin film of gold. The parts A', B' and C' of the transmitted and reflected beam corresponding to the incident part A, B, C of the beam are as shown in the diagram. The number of alpha particle in

A. C' will be minimum and in B' maximum

B. A' will be minimum and in B' maximum

C. A' will be maximum and in B' minimum

D. B' will be minimum and in C' maximum

Answer: C

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7. An alpha particle of energy $5MeV$ is scattered through 180° by a found uramiam nucleus . The distance of closest approach is of the order of

A. $10^{-12} cm$

B. 1 Å

C. $10^{-15} cm$

D. $10^{-10} cm$

Answer: A

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8. The speed of the electron in the 1st orbit of the hydrogen atom in the ground state is (c is the veloicty of light)

A. $\frac{2e^2\varepsilon_0}{hc}$

B. $\frac{2\varepsilon_0 hc}{e^2}$

C. $\frac{e^2}{2\varepsilon_0 hc}$

D. $\frac{e^3}{2\varepsilon_0 hc}$

Answer: C

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9. Energy of the electron in nth orbit of hydrogen atom is given by $E_n = -\frac{13.6}{n^2} eV$. The amount of energy needed to transfer electron from first orbit to third orbit is

A. 1.51eV

B. 3.4eV

C. 13.6eV

D. 12.09eV

Answer: D

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10. Radius of first bohr's orbit of hydrogen atom is 0.53 A then the radius of 3^{rd} bohr orbit is :-

A. $3r_1$

B. $6r_1$

C. $9r_1$

D. $\sqrt{3}r_1$

Answer: C

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11. The energy required to remove an electron in a hydrogen atom from $n=10$ state is

A. 13.6eV

B. 1.36eV

C. 0.136eV

D. 136eV

Answer: C

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12. The total energy of eletcron in the ground state of hydrogen atom is $-13.6eV$. The kinetic enegry of an electron in the first excited state is

A. $-27.2eV$

B. $-6.8eV$

C. $-3.4eV$

D. $-52.4eV$

Answer: C

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13. The energy of electron in an excited hydrogen atom is $-3.4eV$. Its angular momentum according to bohr's theory will be

A. $\frac{nh}{2\pi}$

B. $\frac{h}{\pi}$

C. $\frac{3h}{2\pi}$

D. $\frac{2\pi}{h}$

Answer: B

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14. For an electron in the third orbit Bohr hydrogen atom, the moment of linear momentum is

A. $\frac{h}{2\pi}$

B. $\frac{3h}{2\pi}$

C. $\frac{h}{\pi}$

D. $3\pi h$

Answer: B

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15. The energy of an excited hydrogen atom is -3.4eV. The principal quantum number of the orbit is

A. 1

B. 2

C. 3

D. 4

Answer: B

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16. In hydrogen atom, the total energy of an electron in a given orbit is -1.5eV. The potential energy in the same orbit is

A. 1.5eV

B. 3.0eV

C. $-3.0eV$

D. $-1.5eV$

Answer: C

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17. Radius of first bohr's orbit of hydrogen atom is 0.53 A then the radius of 3^{rd} bohr orbit is :-

A. 2.12 Å

B. 8.48 Å

C. 4.24 Å

D. 1.06 Å

Answer: B

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18. According to bohr model, the diameter of first orbit of hydrogen atom will be

A. 0.53 Å

B. 2.50 Å

C. 1.06 Å

D. 0.25 Å

Answer: C

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

A. $4:1$

B. $2:1$

C. $16:1$

D. $8:1$

Answer: C

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20. For the hydrogen atom the energy of radiation emitted in the transitation from 4th excited state

to 2nd exicited state according to Bohr 's theory is

A. 0.85eV

B. 2.55 eV

C. 3.4 eV

D. 13.6 eV

Answer: B

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21. According to Bohr's theory, the angular momentum of electron in the fifth Bohr orbit is:

A. $1:5$

B. $2:5$

C. $3:5$

D. $5:3$

Answer: B

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22. Calculate the frequency of revolution of electron in the first Bohr orbit of hydrogen atom, if radius of first Bohr orbit is 0.5Å and velocity of electron in the first orbit is $2.24 \times 10^6 m / s$.

A. $0.50 \times 10^{-16} s$

B. $1.52 \times 10^{-16} s$

C. $2 \times 10^{-16} s$

D. $2.52 \times 10^{-16} s$

Answer: B

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23. The orbital electron of the hydrogen atom jumps from the ground state to a higher energy state and its orbital velocity is reduced to one third of its initial value. If the radius of the orbit in the ground state is r, then what is the radius of the new orbit ?

A. 3R

B. 9R

C. 6R

D. 12R

Answer: B

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24. If E_n and L_n denote the total energy and the angular momentum of an electron in the nth orbit of Bohr atom, then

A. $E_n \propto \frac{1}{L_n^2}$

B. $E_n \propto \frac{1}{L_n}$

C. $E_n \propto L_n$

D. $E_n \propto L_n^3$

Answer: A

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25. The ratio of the areas of the circular orbits of an electron in the ground state that of the first excited state of an electron in the hydrogen atom is

A. $16:1$

B. $4:1$

C. $1:4$

D. $1:16$

Answer: D

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26. What is the ratio of radii of orbits corresponding to first excited state and ground state in hydrogen atom?

A. $1:2$

B. $2:1$

C. $8:1$

D. $1:4$

Answer: C

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27. Ground state energy of H-atom is -13.6 eV. The energy needed to ionise H-atom from its second excited state is

A. 3.02 eV

B. 1.51 eV

C. 13.6eV

D. 10 eV

Answer: B

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28. In the nth orbit, the energy of an electron $E_n = -\frac{13.6}{n^2} eV$ for hydrogen atom. The energy rquired to take the electron from first orbit to second orbit will be

A. 13.6 eV

B. 10.2 eV

C. 3.4 eV

D. 8.6 eV

Answer: B

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29. The angular momentum of the electron in a hydrogen atom is proportional to n^{th} power of r (radius of the orbit) where n is :-

A. r

B. r^2

C. $\sqrt{r}$

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

Answer: C

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30. The ground state energy of hydrogen atom is $-13.6eV$. What is the potential energy of the electron in this state

A. $\frac{-13.6}{2}eV$

B. $-13.6 \times 2eV$

C. 0eV

D. 5eV

Answer: B

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31. Energy of electron in first excited state in Hydrogen atom is -3.4eV. Find KE and PE of electron in the ground state.

A. 3.4eV

B. 6.8eV

C. $-6.8eV$

D. $-3.4eV$

Answer: A

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32. Minimum excitation potential of Bohr's first orbit hydrogen atom is

A. 3.4V

B. 6.8V

C. 10.2V

D. 13.6V

Answer: C

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33. The ratio of the areas of the orbit for the second excited state to the first excited state for the hydrogen atom is

A. $2:1$

B. $\frac{9}{4}$

C. $\frac{81}{16}$

D. $\frac{16}{81}$

Answer: C

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34. The angular momentum of an electron moving in a Bohr orbit is $\left(\frac{h}{\pi}\right)$. What is its energy in the same orbit ?

A. $-3.4eV$

B. $-1.51eV$

C. $-4.4eV$

D. $-6.8eV$

Answer: B

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35. Which is the wrong statement from the following ? When an electron moves in the third Bohr orbit of a hydrogen atom

A. 1. Its total energy is -1.51 eV

B. 2. Its orbital radius is 4.77 Å

C. 3. Its angular momentum is $\frac{3}{2}\left(\frac{h}{\pi}\right)$

D. 4. Its total energy is -4.51 eV

Answer: D

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36. In the ground state, the electron in the hydrogen atom moves in a circular orbit of radius r_0 . When the hydrogen atom goes in the second excited state, the radius of the electron orbit is increased by

A. $3r_0$

B. $8r_0$

C. $6r_0$

D. $5r_0$

Answer: B

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37. How many times larger is the spacing between the energy levels corresponding to n=8 and n=7 than the spacing between the energy levels corresponding to n=2 and n=3 , for a hydrogen atom ?

A. 2 times

B. 2.5 times

C. 3 times

D. 3.5 times

Answer: C

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38. The momentum of a photon is p. the corresponding wavelength is

A. $\frac{h}{p}$

B. ph

C. $\frac{h}{p^2}$

D. $\frac{h}{\sqrt{p}}$

Answer: A

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39. The number of photons in radiation of frequency 2×10^{13} Hz and energy content 6.63 J is

A. 10^{21}

B. 10^{20}

C. 5×10^{20}

D. 5×10^{21}

Answer: C

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40. What is the ratio of the energies of an hydrogen atom, when it is in the third and second excited states?

A. $\frac{9}{16}$

B. $\frac{9}{4}$

C. $\frac{16}{9}$

D. $\frac{4}{9}$

Answer: A

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41. In the hydrogen atom, the energies corresponding to first, second and third orbits are given by E_1 = -13.6 eV, E_2 = -3.5eV, E_3 = -1.5 eV.

If the atom emits a photon of energy 12.1 eV, in a transition, then the corresponding change in the angular momentum is given by

A. $\frac{h}{2\pi}$

B. $\frac{h}{\pi}$

C. $\frac{3h}{2\pi}$

D. $\frac{2h}{\pi}$

Answer: B

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42. Energy of electron in first excited state in Hydrogen atom is -3.4eV. Find KE and PE of electron in the ground state.

A. 3.4 eV, 6.8 eV

B. $-6.8eV, 3.4eV$

C. $+3.4eV, (-6.8eV)$

D. $-3.4eV, (+6.8eV)$

Answer: C

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43. If an orbital electron of the hydrogen atom jumps from the groud state to a higher energy state, its orbital value where its velcoity is reduced to half its initial value.. If the radius of the electron orbit in the ground state is r, then the radius of the new orbit would be:

A. 3r

B. 4r

C. 5r

D. 2r

Answer: B

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44. If the electron in a hydrogen atom moves from ground state orbit to 5th orbit, then the potential energy of the system

A. Become zero

B. Is decreased

C. In increased

D. Remained unchanged

Answer: C

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45. As par 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. 40.8

B. 13.6

C. 122.4

D. 1.51

Answer: A

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46. What is the radius of the second orbit of helium atom , on the basis of Bohr's atom model ?

A. 1.06 Å

B. 2.12 Å

C. 0.265 Å

D. 0.53 Å

Answer: A

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47. For an electron moving in n^{th} orbit of H-atom the angular velocity is proportional to

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

B. n^3

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

D. n

Answer: C

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48. As the electron in the Bohr orbit is hydrogen atom passes from state $n=2$ to $n=1$, the $KE(K)$ and $PE(U)$ change as

A. K four-fold , U two - fold

B. K four-fold , U also four - fold

C. k two-fold, U also two - fold

D. K two - fold , U four - fold

Answer: B

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49. The speed of the electron in the 1st orbit of the hydrogen atom in the ground state is (c is the veloicty of light)

A. $\frac{1}{137}$

B. $\frac{2}{137}$

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

D. $\frac{1}{237}$

Answer: A

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50. 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. $E_0 = -27.2eV, r_0 = a_0$

B. $E_0 = -27.2eV, r_0 = \frac{a_0}{2}$

C. $E_0 = -13.6eV, r_0 = a_0$

D. $E_0 = -13.6eV, r_0 = \frac{a_0}{2}$

Answer: B

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51. The force acting on the electron in a hydrogen atom depends on the principal quantum number as

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

B. $F \propto \frac{1}{n^3}$

C. $F \propto \frac{1}{n^4}$

D. $F \propto n^2$

Answer: C

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52. The approximate value of quantum number n for the circular orbit of hydrogen of $0.0001 nm$ in diameter is

A. 100

B. 60

C. 81

D. 31

Answer: D

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53. The energy of a hydrogen atom in its ground state is -13.6 eV. What is the quantum number of the orbit corresponding to the energy level of -0.85 eV?

A. 2

B. 3

C. 4

D. 5

Answer: C

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54. Hydrogen atoms in the ground state are excited by monochromatic radiation photons of energy 12.1 eV. To which orbit the electron will be lifted, if an hydrogen atom absorbs the photon ?

A. Second

B. Third

C. Fourth

D. Fifth

Answer: B

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55. The electron in the hydrogen atom jumps from the second orbit to the fourth orbit after absorbing photon. In this process

A. Velocity is doubled

B. Angular momentum is doubled

C. Linear momentum is doubled

D. Energy is doubled

Answer: B

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56. 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 K 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

Answer: A

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57. Which of the following atoms has the lowest ionization potential ?

A. ${}_{8}O^{16}$

B. ${}_{55}Cs^{133}$

C. ${}_{18}Ar^{40}$

D. ${}_{7}N^{14}$

Answer: B

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58. when a hydrogen atom is raised from the ground state to an excited state

A. Both K.E. and P.E. decrease

B. P.E. increases and K.E. decreases

C. Emission spectrum is produced

D. P.E. decreases and K.E. increases

Answer: B

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59. What is the moment of inertia of the electron moving in second Bohr orbit of a hydrogen atom ?

A. $\frac{4\varepsilon_0^2 h^4}{\pi^2 m e^4}$

B. $\frac{8m\varepsilon_0^2 h^4}{\pi^2 e^4}$

C. $\frac{16\varepsilon_0^2 h^4}{\pi^2 m e^4}$

D. $\frac{\varepsilon_0^2 h^4}{16\pi^2 m e^4}$

Answer: C

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60. How will you express, the energy of the electron in the n^{th} orbit , in terms of the Rydberg constant, planck's constant and the velocity of light ?

A. $E_n = -n^2 Rch$

B. $E_n = -\frac{n^2}{Rch}$

C. $E_n = -\frac{Rch}{n^2}$

D. $E_n = -\frac{ch}{Rn^2}$

Answer: C

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61. For the hydrogen atom the energy of radiation emitted in the transitation from 4th excited state

to 2nd exicited state according to Bohr 's theory is

A. 0.567 eV

B. 0.667 eV

C. 0.967 eV

D. 1.267 eV

Answer: C

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62. The magnitude of the P.E. of the electron in the first orbit of the bohr's atom is E. What is its K.E. ? S

A. E

B. 2E

C. E/2

D. E/4

Answer: C

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63. What is the approximate value of the current in the first orbit of bohr's hydrogen atom ?

(Radius of the first orbit = 0.5 Å and speed of the electron in the first orbit $= 2 \times 10^6 m / s$)

A. 0.01mA

B. 1mA

C. 2.63mA

D. 10mA

Answer: B

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64. If the velocity of an electron in its first orbit of hydrogen atom is 2.1×10^6 m/s, then its velocity in the third orbit is

A. $18.9 \times 10^6 m / s$

B. $6.3 \times 10^6 m / s$

C. $7 \times 10^6 m / s$

D. $7 \times 10^5 m / s$

Answer: D

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65. The orbital frequency of an electron in the hydrogen atom is proportional to

A. n^{-3}

B. n^2

C. n^{-2}

D. n^3

Answer: A

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66. In Bohr's orbit , kinetic energy of an electron in the n^{th} orbit of an atom in terms of angular momentum is propotional to

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

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

C. L^2

D. $\frac{1}{L^3}$

Answer: B

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67. The ionisation energy of hydrogen atom is 13.6eV. What is the ionisation energy of He ?

A. $-27.2eV$

B. $+27.2eV$

C. $+54.4eV$

D. $-54.4eV$

Answer: C

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68. Which energy state of doubly ionized lithium Li^{++} has the same energy as that of the ground state of hydrogen?

A. n=4

B. n=3

C. n=2

D. n=5

Answer: B

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69. The angular momentum of an electron in the hydrogen atom is $\frac{2h}{\pi}$.

What is the potential energy of this electron ?

A. $-0.85eV$

B. $-1.51eV$

C. $-1.70eV$

D. $-4.3eV$

Answer: C

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70. A hydrogen atom in its ground state absorbs 10.2 eV of energy. What is the increase in its orbital angular momentum ? S

A. 2.11×10^{-34} J-sec

B. 3.16×10^{-34} J-sec

C. 1.05×10^{-34} J-sec

D. 4.22×10^{-34} J-sec

Answer: C

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71. The transtion from the state $n = 4 \rightarrow n = 3$ in a hydrogen like atom results in ultraviolet radiation Infrared rediation will be obtained in the transition from :

A. $4 \rightarrow 2$

B. $3 \rightarrow 2$

C. $5 \rightarrow 4$

D. $2 \rightarrow 1$

Answer: C

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72. An electron passing through a potential difference of $4.9V$ collides with a mercury 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. 2935 Å

B. 2525 Å

C. 2240 Å

D. 2050 Å

Answer: B

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73. In a hydrogen atom following the Bohr's postulates the product of linear momentum and angular momentum is proportional to n^x where 'n' is the orbit number. Then 'x' is:

A. 1

B. -2

C. 2

D. 0

Answer: D

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74. What is the orbital acceleration of the electron in the first bohr orbit of hydrogen atom ?

A. $\frac{h}{2\pi^2 m^2 r^3}$

B. $\frac{h^2}{2\pi^2 m^2 r^2}$

C. $\frac{h^2}{4\pi^2 m^2 r^3}$

D. $\frac{h^3}{4\pi^2 m^2 r^2}$

Answer: C

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75. In Bohr model of the hydrogen atom, let R,v and E represent the radius of the orbit, speed of the electron and the total energy respectively. Which of the following quantities are directly proportional to the quantum number n?

A. rE

B. $\frac{v}{r}$

C. vr

D. vE

Answer: C

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76. Find the minimum frequency of light which can ionise a hydrogen atom.

A. $1.5 \times 10^{14} Hz$

B. $2.5 \times 10^{15} Hz$

C. $3.3 \times 10^{15} Hz$

D. $5 \times 10^{15} Hz$

Answer: C

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77. The ionization enegry 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= 2state

B. n=3 to n=1 state

C. n=2 to n=1 state

D. n=4 to n=3 state

Answer: D

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78. An energy of 25.6eV. Is required to remove one of the electrons froma a neutral helium atom. What is the energy (in eV) required to remove both the electrons from a neutral helium atom ?

A. a) 50 eV

B. b) 60 eV

C. c) 70 eV

D. d) 80 eV

Answer: D

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79. Which of the following atoms has the lowest ionization potential ?

A. $^{40}_{18}Ar$

B. $^{133}_{55}Cs$

C. $^{16}_{8}O$

D. $^{14}_{7}N$

Answer: B

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80. 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. $3.8 \times 10^4 K$

B. $5.2 \times 10^4 K$

C. $7.9 \times 10^4 K$

D. $11 \times 10^4 K$

Answer: C

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81. A nucleus of mass 218 amu in Free State decays to emit an α-particle. Kinetic energy of the $\beta-$ particle emitted is $6.7 MeV$. The recoil energy (in MeV) of the daughter nucleus is

A. 0.5 MeV

B. 0.25 MeV

C. 0.125 MeV

D. 1.0 MeV

Answer: C

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82. The ratio between total acceleration of the electron in singly ionized helium atom and hydrogen atom (both in ground state) is

A. 2

B. 4

C. 8

D. 16

Answer: C

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83. 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

Answer: C

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84. Let the potential energy of the hydrogen atom in the ground state be zero . Then its energy in the excited state will be

A. 13.6 eV

B. 27. eV

C. 10.2 eV

D. 23.6eV

Answer: D

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85. The M.I. of a diatomic molecule is I. what is its rotational energy in the nth orbit , (where n $\neq$ 0) if Bohr's quantization condition is used ?

A. $\frac{1}{n}\left(\frac{h^2}{8\pi^2 I}\right)$

B. $n^2\left(\frac{h^2}{8\pi^2 I}\right)$

C. $\frac{1}{n^2}\left(\frac{h^2}{8\pi^2 I}\right)$

D. $n\left(\frac{h^2}{8\pi I}\right)$

Answer: B

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86. As par 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. 5.5 eV

B. 13.6 eV

C. 60.5 eV

D. 122.4 eV

Answer: D

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87. If elements with principal quantum number $n > 4$ were not allowed in nature, the number of possible elements would be:

A. 20

B. 40

C. 60

D. 70

Answer: C

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

A. 3.4 eV

B. 13.6 eV

C. 122.4 eV

D. 30.6 eV

Answer: D

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89. Which of the following statements about the Bohr model of the hydrogen atom is false ?

A. The angular momentum of the electron in any orbit is an integral multiple of $h/2\pi$

B. The total energy of the electron in the n^{th} orbit is inversely proportional to n

C. The magnitude of the potential energy of the electron in any orbit is greater than its kinetic energy .

D. The radius of the nth orbit is proportional to n^2`

Answer: B

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90. In the Bohr model of a hydrogen atom, the centripetal force is furnished by the Coulomb attraction between the proton and the electrons. If a_0 is the radius of the ground state orbit, m is the mass and e is the charge on the electron and e_0 is the vacuum permittivity, the speed of the electron is

A. $\dfrac{e}{\sqrt{4\pi\varepsilon_0 a_0 m}}$

B. $\dfrac{e}{\sqrt{\varepsilon_0 a_0 m}}$

C. $\frac{\sqrt{4\pi\varepsilon_0 a_0 m}}{e}$

D. zero

Answer: A

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91. A hydrogen like atom (atomic number Z) is in a higher excited sate of quantum number n .This excited atom can make a transition to the first excited state by successively emitting two photon of energies $10.20eV$ and $17.00eV$ .Alternatively, the atom from the same excited state can make a transition to the second excited state by successively emitting two photon of energy $4.25ev$ and $5.95eV$ Determine the followings:

The value of atomic number (Z) is

A. 2

B. 3

C. 4

D. 5

Answer: B

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92. If the velocity of the electron in the first Bohr orbit having radius 0.53 Å is 2200 km/s . What is the frequency of the electron in the same orbit ?

A. $5.5 \times 10^{15} Hz$

B. $6.60 \times 10^{15} Hz$

C. $7.32 \times 10^{15} Hz$

D. $4.85 \times 10^{15} Hz$

Answer: B

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93. According to Bohr's theory, the time averaged magnetic field at the centre (i.e. nucleus) of a hydrogen atom due to the motion of electrons in the n^{th} orbit is proportional to :

(n = principal quantum number)

A. $1/n^3$

B. $1/n^5$

C. n^5

D. n^3

Answer: B

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94. Suppose that the mass of an electron is doubled . How will its affect the Rydberg constant ?

A. It is reduced to half of original value

B. It is not affected

C. It is doubled

D. It is increased to four times its original value

Answer: C

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95. The shortest wavelength of Lyman series is 912 Å . That of paschen series is

A. 8460 Å

B. 8208 Å

C. 8415 Å

D. 8430 Å

Answer: B

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96. 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. $\frac{R}{16}$

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

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

D. $\frac{7R}{16}$

Answer: B

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97. The ratio of minimum to maximum wavelength in Balmer series is

A. $4:1$

B. $9:5$

C. $36:5$

D. $4:3$

Answer: B

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98. In Bohr's model of hydrogen atom, an electron jumps from the fifth orbit to the second orbit . Which line of the Balmer series is produced in this transition ?

A. 1. H_{α}

B. 2. $H_{B}\eta$

C. 3. H_{γ}

D. 4. H_{δ}

Answer: C

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99. The maximum wavelength of Lyman series is

A. $\frac{C}{R}$

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

C. $\frac{4}{3R}$

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

Answer: C

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100. The maximum number of photons emitted when an electron jumps from an energy level n=5 to n=1 is s

A. 3

B. 10

C. 8

D. 6

Answer: B

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101. The ratio of the frequencies of the long wavelength limits of the balmer and Lyman series of hydrogen is

A. $27 : 5$

B. $5 : 27$

C. $4 : 1$

D. $1 : 4$

Answer: A

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102. What is the ratio of the series limits of the P fund series to that of the Lyman series in the emission spectrum of hydrogen ?

A. a) $5:2$

B. b) $10:3$

C. c) $525:300$

D. d) $25:1$

Answer: D

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103. When an electron is an excited hydrogen atom, jumps from n = 4 to n= 2 level, green light is emitted . Which colour of light will be observed, if the electron jumps from n=6 to n=2 ?

A. Red

B. Violet

C. Yellow

D. Orange

Answer: B

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104. The wavelength of a line a spectrum is inversely proportional to

A. Number of electrons

B. Velocity of the electrons

C. Difference in energy levels

D. Momentum of the electrons

Answer: C

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105. Ionisation potential of hydrogen atom is $13.6eV$. Hydrogen atom in ground state is excited by monochromatic light of energy $12.1eV$. The spectral lines emitted by hydrogen according to Bohr's theory will be

A. 3

B. 2

C. 5

D. 4

Answer: A

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106. In a hydrogen atom, ultraviolet radiations are emitted when the electron jumps from

A. a) $n_i = 5 \text{to} n_f = 2$

B. b) $n_i = 5 \text{to} n_f = 3$

C. c) $n_i = 6 \text{to} n_f = 5$

D. d) $n_i = 3 \text{ to } n_f = 1$

Answer: D

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107. In a hydrogen atom, infared radiations are obtained in the transition of an electron from

A. $n_i = 2 \text{to} n_f = 1$

B. $n_i = 3 \text{to} n_f = 2$

C. $n_i = 5 \text{to} n_f = 4$

D. $n_i = 6 \text{to} n_f = 2$

Answer: C

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108. In terms of Rydberg's constant R, the wave number of the first Balman line is

A. $\frac{3R}{5}$

B. $\frac{7R}{25}$

C. $\frac{21R}{50}$

D. $\frac{21R}{100}$

Answer: D

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109. If λ_1 and λ_2 are the wavelengths of the first members of the Lyman and paschen series respectively, then $\frac{\lambda_1}{\lambda_2}$ is equal to

A. $1:3$

B. $30:1$

C. $7:50$

D. $7:108$

Answer: D

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110. What is the ratio of wavelength of radiations emitted when an electron in hydrogen atom jump from fourth orbit to second ornti and from third orbit to second orbit?

A. $27:25$

B. $20:25$

C. $25:17$

D. $20:27$

Answer: D

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111. The frequency of series limit of Balmer series of hydrogen atom in terms of Rydberg constant R and velocity of light (C) is

A. 2RC

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

C. $\frac{RC}{4}$

D. 4RC

Answer: C

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112. An electron jumps from the $4th$ orbit to the $2nd$ 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. $\frac{9}{16} \times 10^{15} Hz$

B. $\frac{3}{16} \times 10^5 Hz$

C. $\frac{3}{14} \times 10^{15}$

D. $\frac{3}{4} \times 10^{15} Hz$

Answer: A

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113. If the wavelength of the first line of the Balmer series of hydrogen is 6561Å, the wavelngth of the second line of the series should be

A. 2187 Å

B. 3280 Å

C. 13122 Å

D. 4860 Å

Answer: D

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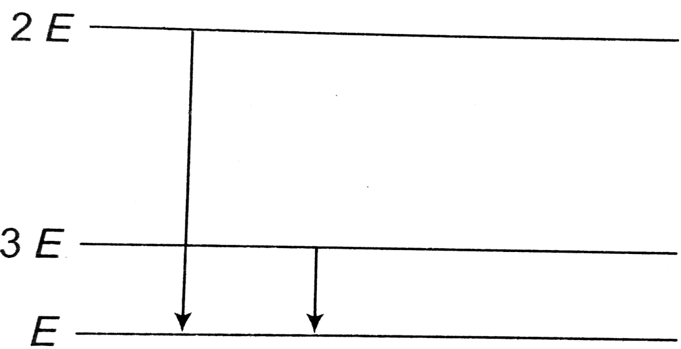
114. The follwing diagram indicates the energy levels of a certain atom when the system moves from $2E$ level to E, a photon of wavelength λ is emitted. The wavelength of photon produced during its transition from $\frac{4E}{3}$ level to E is



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

B. 3λ

C. $\frac{\lambda}{3}$

D. $\frac{3\lambda}{4}$

Answer: B

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115. What is the number of spectral line in a hydrogen spectrum ?

A. Infinite

B. 1

C. 3

D. 4

Answer: A

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116. The wavelength of the radiation emitted with an electron jumps from the fourth orbit to the second orbit in an hydrogen atom is 20.36 cm. what is the wavelength of radiation emitted for the same transition in He^+ ?

A. 10.18 cm

B. 40.72 cm

C. 5.09 cm

D. 81.44 cm

Answer: C

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117. Which of the following phenomena suggests the presence of electron energy levels in atoms

A. α - particles scattering

B. Radioactive decay

C. Matter waves

D. Emission of spectral lines

Answer: D

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118. Which of the following is true for number of spectral lines in going from Lyman series to Pfund series ?

A. Decreases

B. May increases or decreases

C. Increases

D. Remains the same

Answer: A

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119. In a sample of hydrogen like atom all of which are in a ground state, a photon beam containing photons of various energies is passed. In absorption spectrum, five dark lines are observed. The maximum number of bright lines in the emission spectrum will be (assume that all transition take place)-

A. 5

B. 10

C. 15

D. 20

Answer: B

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120. The absorpotion 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. 6

C. 5

D. 4

Answer: B

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121. 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. 25

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

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

Answer: D

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122. The wavelength involved in the spectrum of deuterium $_{-}(1)^{2}D$ are slightly different from that of hydrogen spectrum because

A. Nuclear forces are different in the two cases

B. Attraction between the electron and the nucleus is different in the two cases.

C. Size of the two nuclei are different

D. Masses of the two nuclei are different

Answer: D

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123. When an electron jumps from n=4 to n=2 orbit in a hydrogen atom, we get,

A. Second line of Balmer series

B. Second line of Paschen series

C. An absorption line of Balmer series

D. Second line of Lyman series

Answer: A

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124. If, an electron in hydrogen atom jumps from an orbit of lelvel n=3 to an orbit of level n=2, emitted radiation has a freqwuency (R= Rydbertg's contant ,c = velocity of light)

A. $\frac{3RC}{27}$

B. $\frac{RC}{25}$

C. $\frac{8RC}{9}$

D. $\frac{5RC}{36}$

Answer: D

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125. Which of the following transitions in a hydrogen atom emits photon of the highest frequency ?

A. n=6 to n=2

B. n=2 to n=6

C. n=2 to n=1

D. n=1 to n=2

Answer: C

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126. Wavelength of some of the lines emitted by H atoms are given below. Which lines belongs to Lyman series ?

A. 1526 Å

B. 1026 Å

C. 1326 Å

D. 726 Å

Answer: B

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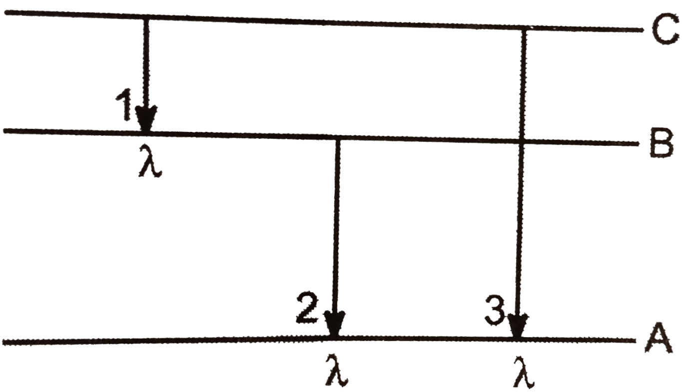
127. Energy levels A B C of a certain atom corresponding to increasing value of energy i.e., E_A E_B E_C If λ_1, λ_2, and λ_3 are the wavelengths of radiations corresponding to the transitions (C) to B, B to (A) and (C) to (A) respectively which of the following statement is correct



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

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

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

D. $\lambda_3 = \dfrac{\lambda_1 \lambda_2}{\lambda_1 + \lambda_2}$

Answer: D

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128. The longest wavelength in the ultraviolet region of the hydrogen spectrum is 120nm. What is the smallest wavelength in the infrared region of the hydrogen spectrum ?

A. 510 nm

B. 810 nm

C. 700nm

D. 950 nm

Answer: B

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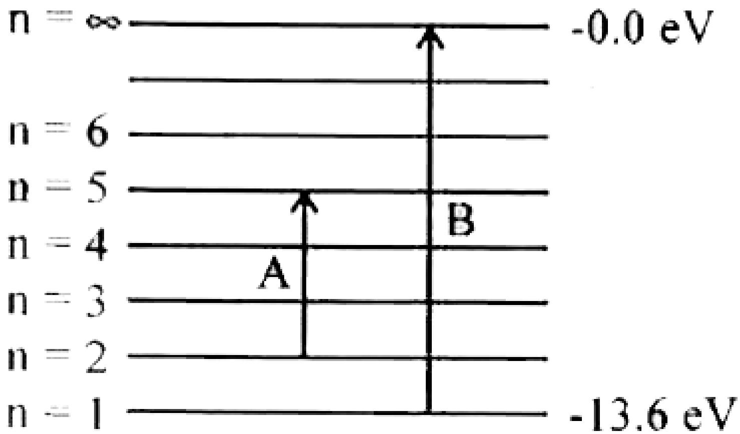
129. The energy level diagram for the hydrogen spectrum with transitions A and B are as shown in the figure. What is represented by A and B



A. Sepctral line of Balmer series and the maximum wavelength of Lyman series

B. Spectral line of Lyman series and the absorption of greater wavelength of limiting value of Paschen series

C. Abroption line of Balmer series and the wavelength lesser than lowest of the Lyman series

D. Absorption line of balmer series and the ionization energy of hydrogen

Answer: D

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130. The following diagram 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. what is the energy level change to get a blue line in the emission spectrum ?

A. Q to R

B. R to G

C. P to Q

D. R to S

Answer: B

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

A. 1,2,3,4,5,6

B. 1,2,3

C. 1,4,6

D. 4,5,6

Answer: B

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132. The force of repulsion between two electrons kept at a distance of 1 m is F. if m is the mass of the electron, h is the planck's constant and c is the velocity of light, then the Rydberg's constant of

A. $\dfrac{F^{22}\pi^2 m}{h^3 C}$

B. $\dfrac{F2\pi^2 m}{h^3 C}$

C. $\dfrac{h^3 C}{F^2 2\pi^2 m}$

D. $\dfrac{F2\pi^2 m}{h^2 C}$

Answer: A

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133. Imagine an atom made of a proton and a hypothetical particle of double the mass of the electron but having the same change as the electron. Apply the Bohr atom model and consider all possible transitions of this hypothetical particle of the first excited level. the longest wavelength photon that will be emitted has wavelength [given in terms of the Rydberg constant R for the hydrogen atom] equal to

A. $\dfrac{9}{5R}$

B. $\dfrac{36}{5R}$

C. $\frac{18}{5R}$

D. $\frac{45}{5R}$

Answer: C

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134. The wavelength of the first spectral line in the Balmer series of hydrogen atom is $6561A^{\circ}$. 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

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135. An excited state of H atom emits a photon of wavelength λ and returns in the ground state. The principal quantum number of excited state is given by:

A. $\lambda R(R-1)$

B. $\sqrt{\lambda R(R+1)}$

C. $\sqrt{\frac{\lambda R}{\lambda R-1}}$

D. $\sqrt{\frac{\lambda R-1}{\lambda R}}$

Answer: C

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136. For balmer series wavelength of first line is λ_1 and for brackett series wavelength of first line is λ_2 then $\frac{\lambda_1}{\lambda_2}$ is

A. 0.081

B. 0.162

C. 0.198

D. 0.238

Answer: B

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

A. $\frac{36}{5}\lambda$

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

C. $\frac{27}{5}\lambda$

D. $\frac{5}{27}\lambda$

Answer: C

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138. The wavelength of radiation emitted is λ_0 when an electron in a hydrogen atom jumps from 3rd to 2nd orbit . If the same hydrogen atom , the electron jumps from 4th orbit to 2nd orbit , then the wavelength of the emitted radiation will be

A. $\frac{10}{25}\lambda_0$

B. $\frac{25}{16}\lambda_0$

C. $\frac{27}{20}\lambda_0$

D. $\frac{20}{27}\lambda_0$

Answer: D

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139. In Davisson - Germer experiment , an electron beam falls on a nickle crystal. The reflected beam consists of

A. X rays s

B. Photons

C. Electrons s

D. Protons

Answer: C

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140. Choose the correct statement from the following ?

A. No particle, whether at rest or in motion , is accompanied by matter waves

B. All particles in motion, whether charged or unchanged, are accompanied by matter waves

C. Only sub-atomic particles like electrons, proton, etc. in motion are accompanied by matter waves

D. Only a charged particle in motion is accompanied by matter waves

Answer: B

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141. A proton and an alpha - particle are accelerated through same potential difference. Then, the ratio of de-Broglie wavelength of proton and alpha-particle is

A. $2\sqrt{2}:1$

B. $1:\sqrt{2}$

C. $\sqrt{2}:1$

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

Answer:

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142. The speed of an electron, having a de broglie wavelength of $10^{-10}m$ is

A. $7.25 \times 10^{6}m/s$

B. $5.25 \times 10^{6}m/s$

C. $4 \times 10^{6}m/s$

D. $8 \times 10^{5}m/s$

Answer:

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143. An α particle and a proton are accelerated in such a way that they get the same kinetic energy. What is the ratio of their de- broglie wavelengths ?

A. $1:1$

B. $1:2$

C. $1:3$

D. $3:2$

Answer: B

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144. If particles are moving with same velocity , then maximum de - Broglie wavelength will be for

A. α particle

B. β particle

C. proton

D. Neutron

Answer: B

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145. An electron and a proton are accelerated through the same potential difference. The ratio of their de broglic wavelengths will be

A. $\left(\frac{m_p}{m_e}\right)^2$

B. $\frac{m_e}{m_p}$

C. $\frac{m_p}{m_e}$

D. 1

Answer:

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146. If the kinetic energy of a free electron doubles , its de - Broglie wavelength changes by the factor

A. 2

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

C. $\sqrt{2}$

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

Answer: D

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147. An electron and proton have the same de-Broglie wavelength. Then the kinetic energy of the electron is

A. Zero

B. Equal to the K.E. of the proton

C. Less than the K.E. of the proton

D. More than the K.E of the proton

Answer: D

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148. A dust particle of mass 2mg is carried by wind with a velocity of 100m/s. What is the de broglie wavelength associated with the dust particle ? $(h = 6.64 \times 10^{-34} J - s)$

A. $3.32 \times 10^{-31} m$

B. $6.64 \times 10^{-30} m$

C. $3.32 \times 10^{-34} m$

D. $3.32 \times 10^{-30} m$

Answer: D

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149. The relation between the circumference of an electron orbit in a hydrogen atom and the de broglie wavelength of the electron in the same orbit is given by

A. $2\pi r = n\lambda$

B. $2\pi r = \frac{nh}{2}$

C. $2\pi r = 2n\lambda$

D. $2\pi r = \frac{n\lambda}{4}$

Answer: A

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150. The de-Broglie wavelength of an electron in the ground state of the hydrogen atom is

A. πr

B. πr^2

C. $2\pi r$

D. $\sqrt{2\pi r}$

Answer: C

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151. What is the wavelength of matter waves associated with a particle of mass 200 gram and moving with a velocity of 100m/s ? $[h = 6.6 \times 10^{-34} Js]$

A. $6.6 \times 10^{-33} m$

B. $3.3 \times 10^{-33} m$

C. $2.2 \times 10^{-34} m$

D. $5.4 \times 10^{-34} m$

Answer:

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152. An electron is having a kinetic energy of 50 eV. Its de broglie wavelength is

A. 1.732 Å

B. 2.5 Å

C. 4.414 Å

D. 6.5 Å

Answer: A::B

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153. A potential difference of 15 KV is applied to accelerate the electron in an electron microscope. The de broglie wavelength of the electron waves is

A. 1 Å

B. 0.1 Å

C. 0.5 Å

D. 0.01 Å

Answer: B

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154. Electron kept in an enclosure at temperature T have a de broglie wavelength λ . If the temperature of the enclosure is increased , then the de broglie wavelength of the electrons will

A. 1. Increase

B. 2. Decrease

C. 3. Not change

D. 4. Be doubled

Answer: B

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155. An electron of mass 'm', when accelerated through a potential V has de-Broglie wavelength λ. The de-Broglie wavelength associated with a proton of mass M accelerated through the same potential difference will be:

A. $\sqrt{\frac{m}{M}}\lambda$

B. $\sqrt{\frac{M}{m}}\lambda$

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

D. $\frac{M}{\lambda m}$

Answer: A

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156. The energy that should be added to an electron to reduce its de - Broglie wavelength from one $nm \rightarrow 0.5nm$ is

A. Half of its initial energy

B. Twice its initial energy

C. Thrice its initial energy

D. Four times its initial energy

Answer: C

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157. The circumference of the third Bohr orbit of an electron is $4.5 \times 10^{-9}m$. What is the de broglie wavelength of the electron in this orbit ?

A. $1.5 \times 10^{-9}m$

B. $3 \times 10^{-9}m$

C. $4.5 \times 10^{-9}m$

D. $6 \times 10^{-9}m$

Answer: A

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158. The de broglie wavelength of an electron moving with a speed of $6.6 \times 10^{5} m / s$ is of the order of $(h = 6.6 \times 10^{-34} Js \text{ and } m_e = 9 \times 10^{-31} kg)$

A. $10^{-12} m$

B. $10^{-11} m$

C. $10^{-9} m$

D. $10^{-7} m$

Answer: C

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159. If the de broglie wavelength of an electron is 1Å, then the velocity of the electron will be

A. 7.3 m/s

B. $7.3 \times 10^{3} m / s$

C. $7.3 \times 10^6 m / s$

D. $3.65 \times 10^6 m / s$

Answer: C

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160. The de broglie wavelength of an electron in the first Bohr orbit is equal to

A. Diameter of the first orbit

B. Circumference of the first orbit

C. Squareroot of the area of the first orbit

D. Twice the circumference of the first orbit

Answer: B

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161. If m is the mass of an electron and c is the speed of light then the ratio of wavelength of a photon of energy E to that of the electron of the same energy is

A. $\sqrt{\frac{2m}{E}}$

B. $c\sqrt{\frac{2m}{E}}$

C. $\sqrt{\frac{2m}{cE}}$

D. $\sqrt{\frac{cm}{E}}$

Answer: B

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162. The value of de broglie wavelength of an electron moving with a speed of $6.6 \times 10^5 m / s$ is approximately equal to

$[h = 6.6 \times 10^{-34} Js \text{ and } m_e = 9 \times 10^{-31} kg]$

A. 21 Å

B. 111 Å

C. 11 Å

D. 33 Å

Answer: A

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163. A grain of sand of mass 1 mg is blown by wind at a speed of 20 m/s. what is the de broglie wavelength associated with the grain ? $\left[h = 6.6 \times 10^{-34} Js\right]$

A. $3.3 \times 10^{-33} m$

B. $3.3 \times 10^{-32} m$

C. $3.3 \times 10^{-35} m$

D. $3.3 \times 10^{-36} m$

Answer: B

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164. A particle of mass 1mg has the same wavelength as an electron moving with a velocity of $3 \times 10^{6} ms^{-1}$. What is the velocity of the particle ?

(Take mass of the electron $= 9 \times 10^{-31} kg$)

A. $2.7 \times 10^{-21} m/s$

B. $2.7 \times 10^{-18} m/s$

C. $3.5 \times 10^{-17} m/s$

D. $9 \times 10^{-5} m/s$

Answer: B

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165. If an em wave of wavelength λ is incident on a photosensitive surface of negligible work function. If the photoelectrons emitted from this surface have the de-Broglie wavelength λ_1, prove that

$$\lambda = \left(\frac{2mc}{h}\right)\lambda_1^2$$

A. $\lambda = \left(\frac{2mc}{h}\right)\lambda_1^2$

B. $\lambda = \frac{2mc}{h}\lambda_1$

C. $\lambda = \frac{h}{2mc}\lambda_1^2$

D. $\lambda = \sqrt{\frac{2mc}{h}}\lambda_1$

Answer: D

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166. According to de broglie , the de broglie wavelength for electron in an orbit of radius 5.3×10^{-11} m of hydrogen atom is 1 Å. What is the principal quantum number for this electron ?

A. 4

B. 3

C. 2

D. 1

Answer: B

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167. A photon and an electron have equal energy E. $\lambda_{\text{photon}} / \lambda_{\text{electron}}$ is proportional to

A. $\frac{1}{\sqrt{E}}$

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

C. $E^{3/2}$

D. $\sqrt{E}$

Answer: A

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168. What is the approximate value of the de broglie wavelength of an electron having 80 eV of electron ?

$\left(1eV = 1.6 \times 10^{-19} J \text{ mass of electron } = 9 \times 10^{-31} kg, \text{ Plank's consta}\right.$

J-sec)

A. 14 Å

B. 1.4 Å

C. 140 Å

D. 0.14 Å

Answer: B

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169. If the de broglie wavelength of a particle is decreased, what will happen to its momentum (p) and K.E. (K) ?

A. Both will decrease

B. Both p and K will increase

C. K will increase, p will decrease

D. K will decrease , p will increase

Answer: B

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170. A photon and an electron moving with a velocity v have the same de broglie wavelength . Then the ratio of the kinetic energy of the electron to the kinetic energy of the photon is [C is the speed of light]

A. a) $\frac{v}{C}$

B. b) $\frac{2v}{C}$

C. c) $\frac{C}{2v}$

D. d) $\frac{v}{2C}$

Answer: D

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171. The de-Broglie wavelength λ

A. Is proportional to mass

B. Is proportional to impulse

C. Is inversely proportional to impulse

D. Does not depend on the impulse

Answer: C

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172. If the radius of the first Bohr orbit is r, then the de broglie wavelength of the electron in the 4th orbit will be

A. $4\pi r$

B. $6\pi r$

C. $8\pi r$

D. $\frac{\pi r}{4}$

Answer: C

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173. The de-Brogile wavelength of a neutron at 927°C is λ. What will be its wavelength at 27°C?

A. λ

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

C. $\frac{3\lambda}{2}$

D. 2λ

Answer: D

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174. A beam of electron is used $YDSE$ experiment . The slit width is d when the velocity of electron is increased ,then

A. No interference is observed

B. Fringe width increases

C. Fringe width decreases

D. Fringe width remains same

Answer: B

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175. A praticle of mass M at rest decays into two particle of masses m_1 and m_2, having non-zero velocities. The ratio of the de Broglie wavelength of the particles $\frac{\lambda_1}{\lambda_2}$ is

A. m_1 / m_2

B. m_2 / m_1

C. 1

D. $\sqrt{m_2} / \sqrt{m_1}$

Answer: A

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176. A photon , an electron and a uranium nucleus all have the same wavelength . The one with the most energy

A. The uranium nucleus

B. The photon

C. Depends upon the wavelength and the properties of the particle

D. The electron

Answer: B

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177. The de-Broglie wavelength of an electron moving in the nth Bohr orbit of radius ris given by

A. $\frac{nr}{2\pi}$

B. $\frac{2\pi r}{n}$

C. $\frac{nr}{\pi}$

D. $n\pi r$

Answer: B

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178. if the de broglie wavelength of an electron is 0.3 nanometre, what is its kinetic energy ?

$\left[h = 6.6 \times 10^{-34} Js, m = 9 \times 10^{-31} kg, 1eV = 1.6 \times 10^{-19} J\right]$

A. 1.68 eV

B. 168 eV

C. 16.8 eV

D. 0.168 eV

Answer: C

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179. The de Broglie wavelength of a molecules of thermal energy KT (K is Boltzmann constant and T is absolute temperature) is given by

A. $\lambda = \sqrt{\frac{h}{2mK_BT}}$

B. $\lambda = \frac{h}{4m^2K_B^2T^2}$

C. $\lambda = h\sqrt{2mK_BT}$

D. $\lambda = \frac{h}{\sqrt{2mK_BT}}$

Answer: D

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180. If an em wave of wavelength λ is incident on a photosensitive surface of negligible work function. If the photoelectrons emitted from this surface have the de-Broglie wavelength λ_1, prove that

$$\lambda = \left(\frac{2mc}{h}\right)\lambda_1^2$$

A. $\sqrt{\frac{2mc}{h\lambda}}$

B. $\sqrt{\frac{h\lambda}{2mc}}$

C. $\sqrt{\frac{hc}{2m\lambda}}$

D. $\frac{2mc}{h\lambda}$

Answer: B

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181. The de Broglie wave present in fifth Bohr orbit is:

A. 

B. 

C.

D.

Answer: D

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182. An elementary particle is moving three times as fast as an electron. The ratio of the de broglie wavelengths of the particle and electron is 1.813×10^{-4} . What is the mass of the particle ? (Mass of electron $= 9.1 \times 10^{-31} kg$)

A. $1.67 \times 10^{-30} kg$

B. $1.67 \times 10^{-31} kg$

C. $1.67 \times 10^{-32} kg$

D. $1.67 \times 10^{-27} kg$

Answer: D

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183. When the mkomentum of a proton is changed by an amount p_0, the corresponding change in the de-Broglie wavelength is found to be 0.25%. Then, the original momentum of the proton was

A. $400P_0$

B. P_0

C. $4P_0$

D. $100P_0$

Answer: A

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184. A potential difference of 100V is applied between two vertical parallel metal plates A and B having fine holes at their centres. An electron of energy 200 eV, passes undeviated through the holes . What is the de

broglie wavelength of the electron, when it comes out of the holes in B ?

A. 1.5 Å

B. 1.75 Å

C. 1.23 Å

D. 1.87 Å

Answer: C

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185. A particle with rest mass m_0 is moving with velocity c. what is the de-Broglie wavelength associated with it?

A. $\frac{h}{m_0 c}$

B. Zero

C. Infinity

D. $\frac{m_0 c}{h}$

Answer: B

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186. We wish to see inside an atom. Assuming the atom to have a diameter of 100 pm, this means that one must be able to resolve a width of say 10 pm. If an electron microscope is used, the minimum electron energy required is about

A. 1.5 KeV

B. 15 KeV

C. 150 KeV

D. 1.5 KeV

Answer: B

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187. The de Broglie wavelength of an electron moving with a velocity of $1.5 \times 10^8 ms^{-1}$ is equal to that of a photon find the ratio of the kinetic energy of the photon to that of the electron.

A. 2

B. 4

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

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

Answer: D

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188. A particle is droped from a height H. The de-broglie wavelength of the particle as a function of height is proportional to

A. H

B. $H^{1/2}$

C. H^{0}

D. $H^{-1/2}$

Answer: D

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189. An electron is moving with an initial velocity $\overrightarrow{v} = v_0\hat{i}$ and is in a magnetic field $\overrightarrow{B} = B_0\hat{j}$. Then it's de-Broglie wavelength

A. Remains constant

B. Increases with time

C. Decreases with time

D. Increases and decreases periodically

Answer: A

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190. If the kinetic energy of the particle is increased to 16 times its previous value , the percentage change in the de - Broglie wavelength of the particle is

A. 60

B. 50

C. 25

D. 75

Answer: D

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191. Write the expression for the de-Broglie wavelength associated with a charged particle having charge 'q' and mass 'm' when it is accelerated by a potential V.

A. $\frac{h}{\sqrt{2mqV}}$

B. $\frac{h^2}{\sqrt{2mqV}}$

C. $\frac{h}{\sqrt{mqV}}$

D. $\frac{h}{\sqrt{2qV}}$

Answer: A

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192. The minimum wavelength of the X - rays produced by electrons accelerated through a potential difference of $V \text{volts}$ is directly proportional to

A. $2\pi r$

B. $4\pi r$

C. $8\pi r$

D. $16\pi r$

Answer: C

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193. The minimum wavelength of the X - rays produced by electrons accelerated through a potential difference of $V \text{volts}$ is directly proportional to

A. $\sqrt{V}$

B. V

C. V^2

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

Answer: D

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194. The shorted wavelength of X- rays emitted from an X- rays tube depends on

A. Accelerating potential

B. Mass of the target

C. Temperature of the target

D. Atomic number of the target

Answer: D

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195. If Z is the atomic number of the target atom, then the frequency of the K_{α} line of the characteristic X ray spectrum is directly proportional to

A. Z

B. Z^2

C. $Z^{1/2}$

D. $Z^{2/3}$

Answer: D

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196. For production of characteristic $K_{\beta}X - rays$, the electron transition is

A. From n=2 to n=1

B. From n=3 to n=1

C. From n=4 to n=2

D. From n=5 to n=2

Answer: B

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197. For the production of M_{α} line of the characteristic X rays, the transition of electron is

A. From n=3 to n=2

B. From n=4 to n=3

C. From n=5 to n=3

D. From n=6 to n=4

Answer: B

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198. An X ray beam has a wavelength of 0.010 Å. What is its momentum ?

$(h = 6.63 \times 10^{9-34} J - s)$

A. $6.63 \times 10^{-22} kgm / \sec$

B. $3.45 \times 10^{-25} kgm / \sec$

C. $3.31 \times 10^{-22} kgm / \sec$

D. $2.12 \times 10^{-23} kgm / \sec$

Answer: A

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199. What is the ratio of the energy of an X ray photon of wavelength 1 Å to that of visible light of wavelength 5000 Å ?

A. $5000 : 1$

B. 1.25×10^6

C. 25×10^6

D. $1 : 5000$

Answer: A

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200. For the production of characteristic K_{γ}, x-ray, the electron transition is

A. n=3 to n=2

B. n=3 to n=1

C. n=4 to n=2

D. n=4 to n=1

Answer: D

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201. The potential difference applied to an X-ray tube is 5 kV and the current through it is 3.2 mA. Then the number of electros striking the target par second is

A. 1×10^{17}

B. 4×10^{15}

C. 5×10^{16}

D. 2×10^{16}

Answer: D

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202. If λ_1 and λ_2 are the wavelength of characteristic X - rays and gamma rays respectively , then the relation between them is

A. $\lambda_1 < \lambda_2$

B. $\lambda_1 = \lambda_2$

C. $\lambda_1 = \frac{1}{\lambda_2}$

D. $\lambda_1 > \lambda_2$

Answer: D

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203. For the production of X rays of wavelength 0.1 Å the minimum potential difference will be

A. 248 KV

B. 124 KV

C. 12.4 KV

D. 24.8 KV

Answer: B

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204. The binding energy of the innermost electron in tungsten is $40keV$. To produce characteristic X - rays using a tungsten target in an X - rays tube the potential difference V between the cathode and the anti - cathode should be

A. V gt 40 KV

B. V gt / lt 40 KV

C. V lt 40 KV

D. $V \leq 40KV$

Answer: A

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205. If the operating potential of an X-ray tube if 50 kV, the velocity of X-rays coming out of it

A. 3 m/s

B. $4 \times 10^4 m / s$

C. $3 \times 10^8 m / s$

D. $10^8 m / s$

Answer: C

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206. X- rays are produced in an X- rays tube operating at a given accelerating voltage . The wavelength of the continuous X- rays has values from

A. 0 to ∞

B. $\lambda_{\min} \text{to} 00 \text{where} \lambda_{\min} > 0$

C. 0 to $\lambda_{\max} \text{where} \lambda_{\max} < \infty$

D. $\lambda_{\min} \text{to} \lambda_{\max} \text{where} 0 < \lambda_{\min} < \lambda_{\max} < \infty$

Answer: B

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207. In an X ray tube , the accelerating voltage for the electrons is increased from 15000 V to 30000 V. then the speed of the emitted X rays inside the tube will be

A. a) $3 \times 10^8 m/s$

B. b) $6 \times 10^8 m/s$

C. c) $1.5 \times 10^8 m/s$

D. d) $2 \times 10^8 m/s$

Answer: A

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208. The potential difference applied to an X-ray tube is increased. As a result, in the emitted radiation,

A. The intesity increases

B. The minimum wavelength increases

C. The intensity decreases

D. The minimum wavelength decreases

Answer: D

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209. The X-ray beam coming from an X-ray tube

A. Having all wavelengths larger than a certain minimum wavelength

B. Having all wavelength lying between a minimum and a maximum wavelength

C. Monochromatic

D. Having all wavelength smaller than a certain maximum wavelength

Answer: A

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210. The shorted wavelength of X- rays emitted from an X- rays tube depends on

A. The current in the tube

B. The voltage applied to the tube

C. The nature of the gas in the tube

D. The atomic number of the target material

Answer: B

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211. When a beam of accelerated electrons hits a target , a continuous X - ray spectrum is emitted from the target. Which of the following wavelength is absent in X - ray spectrum , if the X - ray tube is operating at $40, 000 \text{volts}$?

A. 1.5 Å

B. 1.0 Å

C. 0.5 Å

D. 0.25 Å

Answer: D

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212. A potential difference of $42,000\text{volts}$ is used in an X - ray tube to accelerate electrons . The maximum frequency of the X - radiations produced is

A. $10^{18}Hz$

B. $10^{16}Hz$

C. $10^{20}Hz$

D. $10^{19}Hz$

Answer: D

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213. If the potential difference applied across x-ray tube is V volts, then approximately minimum wavelength of the emitted X-rays will be

A. $\frac{1240}{V}\text{Å}$

B. $\frac{12400}{V}\text{Å}$

C. $\frac{1227}{\sqrt{V}}$Å

D. $\frac{2400}{V}$Å

Answer: B

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214. Which one of the following statement is $WRONG$ in the context of X- rays generated from X- rays tube ?

A. Wavelength of characteristic X ray decreases when the atomic number of the targer increases

B. Cut off wavelength of the continous X rays depends on the atomic number of the target

C. Intensity of the characteristics X rays depends on the electric power given to the X - ray tube

D. Cut off wavelength of the continous X - rays depends on the energy of the electrons in the X rays tube .

Answer: B

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215. An X - ray tube with a copper target emits K_{α} line of copper of wavelength 1.5 Å. What should be the minimum voltage through which the electrons should be accelerated to produce this wavelength of X rays ?

A. a) 8.28 V

B. b) 828 V

C. c) 8280 V

D. d) 82800 V

Answer: C

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216. K_α wavelength emitted by an atom of atomic number Z=11 is λ. Find the atomic number for an atom that emits K_α radiation with wavelength 4λ.

(a) Z=6 (b) Z=4

(c) Z=11 (d) Z=44.

A. 4

B. 6

C. 11

D. 44

Answer: B

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217. Electrons with de-Broglie wavelength λ fall on the target in an X-ray tube. The cut-off wavelength of the emitted X-ray is

A. $lamdqa_0 = \frac{2mc\lambda^2}{h}$

B. $\lambda_0 = \frac{2h}{mc}$

C. $\lambda_0 = \frac{2m^2c^2\lambda^2}{h^2}$

D. $\lambda_0 = \lambda$

Answer: A

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218. Electrons with de-Broglie wavelength λ fall on the target in an X-ray tube. The cut-off wavelength of the emitted X-ray is

A. $\lambda_0 = \frac{2mc\lambda^2}{h}$

B. $\lambda_0 = \frac{2h}{mc}$

C. $\lambda_0 = \frac{2m^2c^2\lambda^2}{h^2}$

D. $\lambda_0 = \lambda$

Answer: D

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219. Which one of the following statements is true for nuclear forces?

A. They are short range forces

B. They are equal in strength to electrostatic forces

C. They obey the inverse third power law of distance

D. They obey the inverse square law of distance

Answer: A

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220. If the nuclear force between two protons, two neutrons and between proton and neutron is denoted by F_{pp}, F_{nn} and F_{pn} respectively, then

A. $F_{pp} \neq F_{\text{nn}} \text{ and } F_{pp} = F_{\text{nn}}$

B. $F_{pp} = F_{\text{nn}} = F_{pn}$

C. $F_{pp} \neq F_{\text{nn}} \neq F_{pn}$

D. $F_{pp} \approx F_{\text{nn}} \approx F_{pn}$

Answer: B

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221. The mass number of He is 4 and that for suphur is 32. The radius of sulphur nuclei is larger than that of helium by

A. 3

B. 4

C. 5

D. 2

Answer: D

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222. The valume of the nucleus of an atom of an element of mass number A is proportional to

A. A

B. A^2

C. A^3

D. $A^{1/3}$

Answer: A

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223. Two nuclei have mass numbers in the ratio 27 : 125. What is the ratio of their nuclear radii ?

A. $\frac{5}{3}$

B. $\frac{2}{3}$

C. $\frac{3}{5}$

D. $\frac{27}{125}$

Answer: C

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224. X rays are incident on a target metal atom having 30 neutrons. The ratio of the atomic radii of the target atom and $_2He^4$ is $(14)^{1/3}$. What is the atomic number of the target atom ?

A. 20

B. 26

C. 30

D. 40

Answer: B

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225. Which of the following nuclear reaction is not possible?

A. ${}_{3}^{7}Li + {}_{2}^{4}He \rightarrow {}_{1}^{1}H + {}_{4}^{10}B$

B. ${}_{6}^{12}C + {}_{6}^{12}C \rightarrow {}_{10}^{20}Ne + {}_{2}^{4}He$

C. ${}_{4}^{9}Be +_{1}^{1} H \rightarrow {}_{3}^{6}Li + {}_{2}^{4}He$

D. ${}_{5}^{11}Be + {}_{1}^{1}H \rightarrow {}_{4}^{9}Be + {}_{2}^{4}He$

Answer: D

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226. One requires energy E_n to remove a nucleon from a nucleus and an energy E_e to remove an electrons from the orbit of an atom. Then

A. $E_n \geq E_e$

B. $E_n = E_e$

C. $E_n < E_e$

D. $E_n > E_e$

Answer: A

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227. As compared to $\hat{} 12C$ atom, $\hat{} 14C$ atoms has

A. Two extra neutrons and no extra electrons

B. Two extra neutrons and two extra electrons

C. Two extra protons and two extra electrons

D. Two extra protons but no extra electrons

Answer: A

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228. When a $._4\,Be^9$ atom is bombarded with $\propto\ -$ particle, one of the product of nuclear transmutation is $._6\,C^{12}$. The other is.

A. $_1D^2$

B. $_0n^1$

C. $_{-1}e^0$

D. $_1H^1$

Answer: B

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229. A reaction between a proton and $._8\,O^{18}$ that produces $._9\,f^{18}$ must also liberate

A. Electron

B. Positron

C. Deuteron

D. Neutron

Answer: D

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230. A nuclear reaction given by

$1_Z X^A \rightarrow .(Z+1) Y^A + ._{-1} e^0 + \overrightarrow{p}$ represents.

A. α decay

B. β decay

C. γ decay

D. Nuclear fission

Answer: B

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231. In the nuclear raction given by $._2 He^4 + ._7 N^{14} \rightarrow ._1 H^1 + X$ the nucleus X is

A. $_7N^{16}$

B. $_7O^{16}$

C. $_7N^{17}$

D. $_8O^{17}$

Answer: D

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232. The ratio of radii of nuclei $._{13} A1^{27}$ and $._{52} X^A$ is $3:5$. The number of neutrons in the nuclei of X will be

A. 52

B. 62

C. 73

D. 95

Answer: C

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233. Let u denote one atomic unit .one atom of an element of mass number A has mass exactly equal A u

A. For any value of A

B. Only for A =1

C. Only for A = 12

D. For any value of A provided the atom is stable

Answer: C

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234. A and B are isotopes. B and C are isobars. If d_A, d_B and d_C be the densities of nuclei A, B and C respectively then

A. $d_A > d_B > d_C$

B. $d_A < d_B < d_C$

C. $d_A = d_B = d_C$

D. $d_A = d_B < d_C$

Answer: C

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235. For a nucleus , Z is the atomic number and A is the mass number .Then the mirror nuclei are those, which have the

A. 1. Same A and same Z

B. 2.Same Z but different A

C. 3. Same A but their atomic numbers differ by 1

D. 4. Same A but their atomic numbers differs by 2

Answer: C

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236. Which one of the following has the highest neutron to proton ratio ?

A. $_8O^{16}$

B. $_2He^4$

C. $_{26}Fe^{56}$

D. $_{92}U^{235}$

Answer: D

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237. Which one of the following is a possible nuclear reaction ?

A. ${}_5B^{10} + {}_2He^4 \rightarrow {}_7N^{13} + {}_1H^1$

B. ${}_{11}Na^{23} + {}_1H^1 \rightarrow {}_{10}N^{20} + {}_2He^4$

C. ${}_{93}Np^{239} \rightarrow {}_{94}Pu^{239} + {}_{-1}e^0$

D. ${}_7N^{11} + {}_1H^1 \rightarrow {}_6C^{12} + {}_{-1}e^0$

Answer: C

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238. For uranium nucleus how does its mass vary with volume?

A. $m \propto \dfrac{1}{V}$

B. $m \propto V$

C. $m \propto \sqrt{V}$

D. $m \propto V^2$

Answer:

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239. Which of the following processes represents a gamma- decay only ?

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

B. $^{A}X_{Z}+{}^{1}n_{0}\rightarrow{}^{A-3}X_{Z-\alpha}+c$

C. $^{A}X_{Z}\rightarrow{}^{A}X_{Z}+f$

D. $^{A}X_{Z}+e^{-1}\rightarrow{}^{A}X(Z-1)+g$

Answer: B::C

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240. When $\_(3)Li^{7}$ nuclei are bombarded by protons , and the resultant nuclei are $\_(4)Be^{8}$, the emitted particle will be

A. Beta particles

B. Gamma particles

C. Alpha particles

D. Neutron

Answer: B

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241. Which one of the following statements / reaction is correct ?

A. 1. ${}_{90}Th^{234} \rightarrow {}_{91}Pa^{234} + {}_{2}He^{4}$

B. 2. ${}_{92}U^{238} \rightarrow {}_{90}Th^{234} + {}_{2}He^{4}$

C. 3. ${}_{84}Po^{214} \rightarrow {}_{82}Pb^{210} + \beta^{-}$

D. 4. ${}_{78}Pt^{192}$ has 78 neutrons

Answer: B

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242. The mass number of a nucleus is

A. Always equal to its atomic number

B. Sometimes more than and sometimes equal to its atomic number

C. Always less than its atomic number

D. Always more than its atomic number

Answer: B

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243. When a boron nucleus ($\_5^{10}B$) is bombarded by a neutron, an α-particle is emitted. Which nucleus will be formed as a result?

A. ${}_1H^2$

B. ${}_3Li^7$

C. ${}_2Li^8$

D. $_4Li^7$

Answer: C

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244. In the nucleus of $._{11}Na^{23}$, the number of protons, neutrons and electrons are

A. 23,11,12

B. 23,12,11

C. 12,11,0

D. 11,12,0

Answer: D

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245. The mass density of a nucleus varies with mass number A as

A. $\rho \propto A$

B. $\rho \propto A^2$

C. $\rho \propto \frac{1}{A}$

D. ρ is independent of A

Answer: D

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246. When a deuterium is bombarded on $._8 O^{16}$ nucleus, an α-particle is emitted, then the product nucleus is

A. $_5B^{10}$

B. $_7N^{14}$

C. $^{13}_{7}$

D. $_4Be^9$

Answer: B

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247. If the nucleus of $._{13}Al^{27}$ has a nuclear radius of about 3.6 fm, then $._{52}Te^{125}$ would have its radius approximately as

A. 5.5

B. 6

C. 7.2

D. 8.4

Answer: B

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248. $.^{22}Ne$ nucleus after absorbing energy decays into two $\alpha-$ particles and an unknown nucleus. The unknown nucleus is.

A. Oxygen

B. Boron

C. Carbon

D. Nitrogen

Answer: C

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249. A nucleus ruptures into two nuclear parts, which have their velocity ratio equal to $2:1$. What will be the ratio of their nuclear size (nuclear radius)?

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

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

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

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

Answer: D

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250. The satble nucleus that has a radius half that of Fe^{56} is

A. S^{16}

B. Na^{21}

C. 10^{12}

D. 10^{8}

Answer: B::C

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251. The fraction of volume occupied by the nucleus with respect to the total volume of an atom is.

A. 10^4

B. 10^{-12}

C. 10^{12}

D. 10^8

Answer: B

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252. 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. $2:1$

B. $1:2$

C. $1:4$

D. $4:1$

Answer: D

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253. Consider the following nuclear reaction for a β decay

$_{83}X^{210} \rightarrow {}_{84}Y^{210} + (-1)e^{0}$

In a β m the neutron to proton ratio

A. Increases

B. Decreases

C. Remains constant

D. May increase or decrease

Answer: B

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254. what is the missing particle or nuclide in the box $\square$, in the following nuclear reaction ?

$_{7}N^{14}(\square P)_{6}C^{14}$?

A. ${}_1P^1$

B. ${}_{-1}e^0$

C. $(+1)e^0$

D. ${}_0n^1$

Answer: D

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255. In the nuclear reaction : $X(n, \alpha)_3Li^7$ the term X will be 3

A. ${}_5B^9$

B. ${}_5B^{10}$

C. ${}_5B^{11}$

D. ${}_2He^4$

Answer: B

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256. If radius of the $._{13}^{27} A1$ nucleus is taken to be R_{A1} then the radius of $._{53}^{125} Te$ nucleus is nearly.

A. $\frac{5}{3}R_{Al}$

B. $\frac{3}{5}R_{Al}$

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

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

Answer: A

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257. Show that energy equivalent of one atomic mass unit is nearly $933 MeV$.

Take $1 amu = 1.66 \times 10^{-27} kg$

A. $1.6 \times 10^{-19} J$

B. $9.31 MeV$

C. $6.02 \times 10^{23} J$

D. $931 MeV$

Answer: D

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

A. $F_1 > F_2 > F_3$

B. $F_1 < F_3 < F_2$

C. $F_1 = F_2 = F_3$

D. $F_3 > F_2 > F_1$

Answer: C

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259. Which one is the correct equation ?

A. $E^2 = p^2c^2$

B. $E^2 = p^2c$

C. $E^2 = pc^2$

D. $E^2 = p^2 / c^2$

Answer: A

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260. Consider the nuclear reaction $X^{200} \rightarrow A^{110} + B^{80}$. The binding energy per nucleon for X, A and B are 7.4 MeV, 8.2 MeV and 8.1 MeV respectively. What is the energy released in the nuclear reaction ?

A. a) 380 MeV

B. b) 190 MeV

C. c) 100 MeV

D. d) 70 MeV

Answer: D

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261. 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 particle) of mass 4.0015a.m.u. The binding energy of the helium nucleus will be $(1a.\ m.\ u.\ = 931MeV)$.

A. 14.2 MeV

B. 28.4 MeV

C. 20.8 MeV

D. 27.3 MeV

Answer: B

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262. 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. 1

B. 28

C. 7

D. 4

Answer: C

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

A. $M = [NM_n + ZM_p]$

B. $M = N[M_n + M_p]$

C. $M < [NM_n + ZM_p]$

D. $M > [NM_n + ZM_p]$

Answer: C

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264. If a H_2 nucleus is completely converted into energy, the energy produced will be around.

A. 9.38 MeV

B. 238 MeV

C. 1 MeV

D. 930 MeV

Answer: D

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265. The mass defect in a particular nuclear reaction is 0.3 grams. The amont of energy liberated in kilowatt hours is.

(Velocity of light $= 3 \times 10^8 m / s$).

A. 7.5×10^6

B. 3×10^6

C. 1.5×10^6

D. 2.5×10^6

Answer: A

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266. 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. $6 \times 10^{-10} J$

Answer: B

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267. 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. $\frac{2}{3}$

B. $\frac{4}{9}$

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

D. $\sqrt{\frac{5}{9}}$

Answer: C

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268. If M_o is the mass of an oxygen isotope $._8 O^{17}$, M_p and M_N are the masses of a proton and neutron respectively, the nuclear binding energy of the isotope is:

A. M_0C^2

B. $(M_0 - 8M_p)C^2$

C. $(M_0 - 17M_N)C^2$

D. $(M_0 - 8M_p - 9M_N)C^2$

Answer: D

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269. This binding energy per nucleon for the parent nucleus is E_1 and that for the daughter nuclei is E_2. Then

A. $E_1 = 2E_2$

B. $E_1 > E_2$

C. $E_2 > E_1$

D. $E_2 = 2E_1$

Answer: C

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270. which a U^{238} nucleus original at rest , decay by emitting an alpha 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: D

Watch Video Solution

271. Consider the nuclear reaction, ${}_1H^2 + {}_1H^2 \rightarrow {}_2He^4 + Q$. What is the value of Q if mass of ${}_1H^2 = 2.0141u$ and mass of ${}_2He^4$ = 4.0024 u.

A. 20 MeV

B. 22 MeV

C. 24 MeV

D. 30 MeV

Answer: C

Watch Video Solution

272. Let m_p be the mass of a proton , m_n the mass of a neutron, M_1 the mass of a $._{10}^{20}Ne$ nucleus and M_2 the mass of a $._{20}^{40}Ca$ nucleus . Then

A. $M_2 > 2M_1$

B. $M_2 < 2M_1$

C. $M_1 < 10(m_n + m_p)$

D. $M_2 = 2M_1$

Answer: B

Watch Video Solution

273. The mass of a 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. 46 MeV

B. 23 MeV

C. 5.6 MeV

D. 3.2 MeV

Answer: C

Watch Video Solution

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

A. To cool the reactor

B. To control the energy released in the reactor

C. To slow down the neutrons to thermal energies

D. To absorb neutrons and to stop the chain reaction

Answer: C

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275. In nucleus fission process, energy is released because

A. Total binding energy of products formed due to nuclear fission is less than that of the parent fissionable material

B. Mass of the products is more than the mass of the nucleus

C. Mass of some particles is converted into energy

D. Total binding energy of the products formed due to nuclear fission is more than that of the parent fissionable material

Answer: D

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276. Fission of nuclei is possible because the binding energy per nuclei in them

A. Heavy nuclei

B. Elements lying in the middle of binding energy curve

C. Element lying in the middle of periodic table

D. Light nuclei

Answer: D

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277. Fission of nuclei is possible because the binding energy per nuclei in them

A. Increases with mass number at low mass number

B. Decreases with mass number at high mass number

C. Decreases with mass number at low mass number

D. Increases with mass number at high mass number

Answer:

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278. Thermal neutrons are those which.

A. Move with very high velocities

B. Have approximately the same kinetic energies as those of the surrounding molecules

C. Are at rest

D. Are at very high temperature

Answer: B

Watch Video Solution

279. 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. $9 \times 10^{12} J$

B. $9 \times 10^{10} J$

C. $9 \times 10^{13} J$

D. $9 \times 10^{11} J$

Answer: C

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280. A chain reaction is continuous due to

A. Large energy

B. Production of more neutrons n fission

C. Production of more protons in fission

D. Large mass defect

Answer: D

Watch Video Solution

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

A. α particle

B. Deuteron

C. Proton

D. Neutron

Answer: C

Watch Video Solution

282. Heavy water is

A. Compound of heavy oxygen and heavy hydrogen

B. Compound of deuterium and oxygen

C. Water, in which soap does not dissolve

D. Water at $4^\circ C$

Answer: B

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

A. 1. Is less than one

B. 2. Is equal to one

C. 3. Is greater than one

D. 4. Depends on the mass of fissionable material

Answer: C

Watch Video Solution

284. The operation of a nuclear reactor is said to be critical, if the multiplication factor (k) has a value

A. 2.5

B. 2

C. 1.5

D. 1

Answer: D

Watch Video Solution

285. The equation

$4H^{+} \rightarrow^{4}_{2} He^{2+} + 2e \overline{+} 26MeV represents$

A. $B\eta$ decay

B. γ decay

C. Fusion

D. Fission

Answer: C

Watch Video Solution

286. Fast neutrons can easily be slowed down by

A. The use of lead shielding

B. Passing them through water

C. Elastic collisions with heavy nuclei

D. Applying a strong electric field

Answer: B

Watch Video Solution

287. Which one of the following statements is correct ?

A. 1. In nuclear fission , energy is released by fusion two nculei of medium mass (approximately 100 amu)

B. 2. The rest mass of a stable nucleus is equal to the sum of the rest masses at its separated nucleons

C. 3. In nuclear fission , energy is released by fragmentation of a very heavy nucleus

D. 4. The rest mass of a stable nucleus is greater than the sum of rest masses of its separated nucleons

Answer: C

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288. Energy released in the fission of a single $_{92}U^{235}$ nucleus is 200 MeV . What is the fission rate of a $_{92}U^{235}$ filled nuclear reactor operating at a power level of 500 MW ?

A. a) $1.56 \times 10^{-17} s^{-1}$

B. b) $1.56 \times 10^{19} s^{-1}$

C. c) $1.56 \times 10^{16} s^{-1}$

D. d) $1.56 \times 10^{-10} s^{-1}$

Answer: B

Watch Video Solution

289. Consider the nuclear reaction ,

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

If the binding energies of $_1H^1, {}_1H^3$ and $_2He^4$ are a, b and c respectively (in MeV), then the energy released in this reaction is

A. (a+b)-c

B. c-(a+b)

C. a+b+c

D. c+a-b

Answer: B

Watch Video Solution

290. Which of the following equactions pick out the possible nuclear fusion reactions?

A. ${}_{6}C^{13} + {}_{1}H^{1} \rightarrow {}_{6}C^{14} + 4.3MeV$

B. ${}_{6}C^{12} + {}_{1}H^{1} \rightarrow {}_{7}N^{14} + 2MeV$

C. ${}_{7}N^{14} + {}_{1}H^{1} \rightarrow {}_{8}O^{15} + 7.3MeV$

D. ${}_{92}U^{235} + {}_{0}n^{1} \rightarrow {}_{54}Xe^{140} + {}_{36}Sr^{94} + {}_{0}n^{1} + {}_{0}n^{1} + y + 2000MeV$

Answer: C

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291. During a negative beta decay,

A. A neutron in the nucleus decays emitting an electron

B. A part of the binding energy of the nucleus is converted into an electron

C. An electron which is already present within the nucleus is ejected

D. An atomic electron is ejected

Answer: A

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292. The most penetrating radiation out of the following is

A. γ rays

B. X rays

C. α rays

D. β rays

Answer: A

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

$A \rightarrow B + ._2 He^4$

$B \rightarrow C + 2e^-$

Then.

A. A and B are isobars

B. A and C are isotopes

C. A and C are isobars

D. A and B are isotopes

Answer: B

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294. The activity of a radioactive sample

A. 1. Can be increased by heating it

B. 2. Can be decreased by using a reducing agent

C. 3. Can be increased by cooling it

D. 4. Cannot be increased or decreased by any method

Answer: D

Watch Video Solution

295. When radioactive substance emits an $\alpha -$ particle, then its position in the periodic table is lowered by.

A. Increased by one place

B. Lowered by two places

C. Lowered by three places

D. Increased by four places

Answer: C

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296. The beta particles of a radioactive metal originate from -

A. the free electrons in the atom

B. The electrons orbiting in the inner orbits around the nucleus

C. Photons escaping from the inner and outer orbits of the atom

D. The decay of a neutron into a proton in the nucleus

Answer: A

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297. The correct order of ionising capcity of α, β and γ-rays is

A. x lt y lt z

B. y gt x gt z

C. x gt y gt z

D. x gt z gt y

Answer: A

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298. An element of atomic number Z and mass number A, emits an α particle, a β particle and γ radiations. What is the atomic number and mass number of the daughter element ?

A. a) Z-1 and A

B. b) Z-1 and A-2

C. c) Z-1 and A-4

D. d) Z-2 and A-4

Answer: B

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299. ${}^{222}_{86}Rn$ goes through radioactive distintegrations by successive emissions of $\alpha, \alpha, \beta, \beta, \alpha, \beta$ and β particles. Then final nucleus is

A. a. ${}^{206}_{82}Pb$

B. b. ${}^{210}_{84}Po$

C. c.${}^{211}_{86}Ra$

D. d.${}^{209}_{83}Bi$

Answer: B

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300. A beam of α, β, γ rays is travelling along X - axis. When it enters a region of uniform magentic field, α particles are deflected towards the Y-axis , then

A. 1. γ rays will turn towards Z-axis

B. 2. β and γ rays will also turn towards (Y axis)

C. 3. γ rays will turn towards (-Yaxis)

D. 4.β rays will turn towards (-Yaxis)

Answer: D

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301. A radioactive nucleus emits a beta particle. The parent and daughter nuclei are:

A. Isomers

B. Isotopes

C. Isobars

D. Isotones

Answer: C

Watch Video Solution

302. The compositon of an α particle can be expressed as

A. a) 2P + 1N

B. b) 1P + 1N

C. c) 2P + 2N

D. d) 1P + 2N

Answer: C

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303. If the end A of a wire is irradiated with α-rays and the other end B is irradiated with β-rays. Then

A. A current will flow from A to B

B. A current will flow from B to A

C. There will be no current in the wire

D. A current will flow from each end to the mid - point of the wire

Answer: A

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304. The 'rad' is the correct unit used to report the measurement of :

A. The biological effect of radiation

B. The rate of decay of a radioactive source

C. The ability of a beam of gamma ray photons to produce ions in a target

D. The energy delivered by radiation to a target

Answer: A

Watch Video Solution

305. In gamma ray emission from a nucleus

A. Only the proton number changes

B. Only the neutron number changes

C. Both the neutron number and proton number change

D. There is no change in the proton number and the neutron number

Answer: D

Watch Video Solution

306. Consider a particle , β particle and $\gamma - rays$, each having an energy of $0.5 MeV$. In increase order of panetrating power , the radiation are .

A. α, β, γ

B. α, γ, β

C. β, γ, α

D. γ, β, α

Answer: A

Watch Video Solution

307. At a specific instant emission of radioactive compound is deflected in a magnetic field . The compound can emit

(i) electron (ii)protons(iii)He^{2+}(iv) neutrons

The emission at instant can be

A. (i), (ii), (iii), (iv)

B. (iv)

C. (ii), (iii)

D. (i), (ii), (iii)

Answer: D

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308. Which of the following radiation has the least wavelength ?

A. γ rays

B. α rays

C. β rays

D. X rays

Answer: A

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

$\alpha, \beta^{-}, \beta^{-}, \alpha, \alpha, \alpha, \alpha, \alpha, \beta^{-}, \beta^{-}, \alpha, \beta^{+}, \beta^{+}, \alpha$. The Z of the resulting nucleus is

A. 82

B. 74

C. 76

D. 78

Answer: D

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

A. Electron

B. Neutrons

C. Protons

D. Helium nuclei

Answer: C

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311. Which one of the following is a correct statement ?

A. 1. Protons and neutrons have exactly the same mass

B. 2. Alpha particles are singly ionized helium atoms

C. 3. Beta rays are the same as cathode rays

D. 4. Gamma rays are high energy neutrons

Answer: C

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312. The nuclei $._6 C^{13} \& ._7 N^{14}$ can be described as

A. Isotopes of carbon

B. Isobars

C. Isotopes of nitrogen

D. Isotones

Answer: D

Watch Video Solution

313. Beta rays emitted by a radicactive material are

A. The electrons orbiting around the nucleus

B. Negative charged particles emitted by the nucleus

C. Neutral particles

D. Electromagnetic radiations

Answer: B

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314. What is the respective number of α and β particles emitted in the following radioactive decay

$\cdot_{90} X^{200} \rightarrow \cdot_{80} Y^{168}$.

A. 8 and 8

B. 8 and 6

C. 6 and 6

D. 6 and 8

Answer: B

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315. In the given nuclear reaction A, B, C, D, E represents

$\cdot_{92}U^{238} \rightarrow^{\alpha} \cdot_{B}Th^{A} \rightarrow^{\beta} \cdot_{D}Pa^{C} \rightarrow^{E} \cdot_{92}U^{234}$.

A. A=238, B=93, C=234, D=91, E=β

B. A=234, B=90, C=234, D=93, E=α

C. A=234, B=90, C=234, D=91, E=β

D. A=234, B=90, C=238, D=94, E=α

Answer: C

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316. During alpha decay of a nucleus, how does the neutron to proton ratio change?

A. Increases

B. Decreases

C. Remains constant

D. May increase or decrease

Answer: A

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317. A nucleus $_{Z}X^{A}$ emits 6α particles and 4β particles is converted into $_{Z'}X_{2}^{A'}$. What is the ratio of the total number of proton and neutrons in $_{Z'}X_{2}^{A'}$?

A. $\dfrac{Z-10}{A-Z-8}$

B. $\dfrac{Z-8}{A-Z-16}$

C. $\dfrac{Z-12}{A-Z-10}$

D. $\dfrac{Z-6}{A-Z-18}$

Answer: B

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318. A radiaoactive nucleus (initial mass number A and atomic number Z emits 3α- particles and 2 positrons The ratio of number of neutrons to that of proton in the final nucleus will be

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

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

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

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

Answer: C

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319. The nuclei of which one of the following pairs of nuclei are isotons ?

A. ${}_{38}Sr^{84}, {}_{38}Sr^{86}$

B. ${}_{34}Se^{74}, {}_{31}Ga^{71}$

C. ${}_{20}Ca^{40}, {}_{16}S^{32}$

D. ${}_{42}Mo^{92}, {}_{40}Zr^{92}$

Answer: B

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

A. 0.37

B. 0.5

C. 0.55

D. 0.63

Answer: D

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321. A counter gives a count of 320 counts/minute for a radioactive source . After 75 minutes, the counter shows a count rate of 40 counts/minute . What is the half life period of the source ?

A. 15 min

B. 25 min

C. 35 min

D. 40 min

Answer: B

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322. The half life of a radio isotope is 3h. The mass of the isotope at time t=0 is 160 gm. What is the mass of the isotope left after 15 h ?

A. 2.5g

B. 5g

C. 7.5g

D. 10g

Answer: B

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323. The decay constant of a radioactive element is $1.05 \times 10^{-4}/$ year. What is its half life ?

A. 5000 years

B. 6000 years

C. 6600 years

D. 7200 years

Answer: C

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324. A box contains a radioactive material of mass 14.58 gram at time t=0. What is the mass ofo the element left in the box after a time of 2 mean lives ? (take e=2.7)

A. a) 4.5g

B. b) 3.7g

C. c) 2g

D. d) 1.1g

Answer: C

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325. The distance constant λ of a radioactive material depends upon the temperature T according to the following relation in which a and b are constants for the material .

A. a) $\lambda = aT$

B. b) $\lambda = aT^{-1}$

C. c) $\lambda = aT^{0}$

D. d)$\lambda = aT + bT^{-1}$

Answer: C

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326. N atoms of a radioactive element emit n alpha particles per second. The half-life of tge element is.

A. $\frac{N}{n}\sec$

B. $\frac{0.693N}{n}\sec$

C. $\frac{0.693n}{n}\sec$

D. $\frac{n}{N}\sec$

Answer: B

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327. The half life of I^{131} is 8 day. Given a sample of I^{131} at t=0, we can assert that a)No nucleus will decay at t=4day b)No nucleus will decay before t=8day c)All nucleus will decay before t=16day d)A given nucleus may decay before

A. All nuclei will decay before t= 16 days

B. No nucleus will decay before t=4 days

C. The given nucleus may decay at any time after t=0

D. No nucleus will decay before t=8 days

Answer: C

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328. The acticity 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. 21 days

B. 18 days

C. 12 days

D. 7 days

Answer: A

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329. The half-life of a radioactive substance is 48 hours. How much time will it take to disintegrate to its $\frac{1}{16} th$ parts ?

A. About 2/3 of the substance

B. About 90% of the substance

C. Almost all the substance

D. About 1/3 of substance

Answer: A

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330. 99% of a radioactive element will decay between

A. 8 and 9 half lives

B. 7 and 8 half lives

C. 9 and 10 half lives

D. 6 and 7 half lives

Answer: D

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331. The half life of radioactive substance is 1.1×10^7 s. What is the decay rate for 4.4×10^{15} atoms of the substance ?

A. 2.2×10^9 atoms/s

B. 2.77×10^8 atoms/s

C. 4.6×10^9 atoms/s

D. 4.6×10^7 atoms/s

Answer: B

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

A. All active nuclei will decay

B. Less than 50% of the active nuclei will decay

C. Less than 60% of the active nuclei will decay

D. More than 70% of the active nuclei will decay

Answer: D

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333. 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. Zero

B. 2×10^{10}

C. 3×10^{10}

D. 1.5×10^{10}

Answer: D

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334. The half life of radioactive substance is 10 year. How long will it take to reduce to one fourth of its original amount and what is the value of its decay constant ?

A. 40 year , $\frac{0.693}{3}$ / year

B. 30 year , $\frac{0.693}{2}$ / year

C. 20 year, 0.0693 / year

D. 10 year, 0.00693 / year

Answer: C

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335. Mean life of a radioactive sample is 100s . Then ,its half-life (in min) is

A. 0.693 min

B. 10^{-4} min

C. 1.155 min

D. 1 min

Answer: C

Watch Video Solution

336. In a sample of radioactive material , what fraction of the initial number of active nuclei will remain undisintegrated after half of the half life of the sample ?

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

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

C. $2\sqrt{2}$

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

Answer: B

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337. An archaeologist analyses the wood in a phehistoric structure and finds that C^{14} (Half-life $= 5700$ years) to C^{12} only one-fourth of that found in the cells buried plants. The age of the wood is about

A. 22,800 years

B. 11,400 years

C. 5700 years

D. 2850 years

Answer: B

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338. If the mass of a radioactive sample is doubled, the activity of the sample and the disintegration constant of the sample are respectively

A. A increases , λ decreases

B. A decreases , λ increases

C. A increases , λ remains the same

D. A decreases , λ remains the same

Answer: C

Watch Video Solution

339. Suppose that a radioactive substance disintegrates completely in 10 days. Each day it disintegrates at a rate twice the previous day. Then after nine days the percentage of the material left to be disintegrated is

A. a) 0.1

B. b) 0.25

C. c) 0.2

D. d) 0.5

Answer: D

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340. Half life period and mean life period of a radioactive element are

A. a.Inversely proportional to each other

B. b. Directly proportional to each other

C. c. Equal to each other

D. d. Not related to each other

Answer: B

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341. 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 years, then the age of the fossil bone is :

A. 17190 years

B. 22920 years

C. 45840 years

D. 11460 years

Answer: B::D

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342. Two radioactive materials X_1 and X_2 have decay constants 10λ and λ respectively. If initially they have the same number of nuclei, then the ratio of the number of nuclei of X_1 to that of X_2 will be $1/e$ after a time.

A. $\frac{1}{10\lambda}$

B. $\frac{1}{11\lambda}$

C. $\frac{11}{10\lambda}$

D. $\frac{1}{9\lambda}$

Answer: A

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

A. $400\mu s$

B. $300\mu s$

C. $40\mu s$

D. $6.3\mu s$

Answer: C

Watch Video Solution

344. If N_0 is the original mass of the substance of half - life period $t_{1/2} = 5year$ then the amount of substance left after 15 year is

A. $N_0/16$

B. $N_0/4$

C. $N_0/8$

D. $N_0/2$

Answer: B

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345. 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. 5 min

C. 14 min

D. $7\frac{1}{2}$ min

Answer: D

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346. A freshly prepared radioactive source of half-life $2h$ emits radiation of intensity which is 64 times the permissible safe level. The minimum time after which it would be possible to work safely with this source is

A. 24h

B. 128h

C. 6h

D. 12h

Answer: A

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347. Two radioactive materials X_1 and X_2 have decay constants 5λ and λ respectively. If initially they have the same number of nuclei, then the ratio of the number of muclei of X_1 to that of X_2 will be $\frac{1}{e}$ after a time

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

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

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

D. λ

Answer: B

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348. The half-life period of radium is 1600 years. The fraction of a sample of radium that would remain after 6400 years is.

A. $\frac{1}{8}$

B. $\frac{1}{16}$

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

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

Answer: D

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349. The half-life of radioactive material is $3h$. If the initial amount is $300g$, then after $18h$, it will remain

A. 9.375 g

B. 46.8 g

C. 93.75 g

D. 4.68 g

Answer: A

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350. Half-life period of a radioactive substance is $6h$. After $24h$ activity is $0.01\mu C$, what was the initial activity ?

A. $0.16\mu C$

B. $0.08\mu C$

C. $0.04\mu C$

D. $0.24\mu C$

Answer: A

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351. Half-life of a radioactive substance is $12.5h$ and its mass is $256g$. After what time the amount of remaining substance is $1g$?

A. 100h

B. 75h

C. 150h

D. 125h

Answer: A

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

A. $R_1 = R_2\left(\frac{t_2}{t_1}\right)$

B. $R_1 = R_2 e^{(-\lambda)(t_1 - t_2)}$

C. $R_1 = R_2$

D. $R_1 = R_2 e^{\lambda(t_1 - t_2)}$

Answer: B

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353. The decay constant of a radioactive sample is λ. The half-life and mean life of the sample respectively are

A. $\frac{\log_e 2}{\lambda}$ and $\frac{1}{\lambda}$

B. $\frac{1}{\lambda}$ and $\frac{\log_e 2}{\lambda}$

C. $\frac{\lambda}{\log_e 2}$ and $\frac{1}{\lambda}$

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

Answer: A

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354. 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 had decayed and time t_1 when $\frac{1}{3}$ of it had decay is

A. 7min

B. 14min

C. 20min

D. 28min

Answer: C

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

A. 5g

B. 2.7g

C. 1.35g

D. 0.8g

Answer: C

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356. 7/8 of the original mass of a radioactive substance decays in 30 min. What is the half life of the radioactive substance ?

A. a) 5 min

B. b) 7.5 min

C. c) 10 min

D. d) 15 min

Answer: C

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357. A radioactive sample with a half life of 1 month has the label : "Activity = 4 micro curie on 11-12-2013" . What will be activity after two months ?

A. 8 micro curie

B. 4 micro curie

C. 1.0 micro curie

D. 0.5 micro curie

Answer: C

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358. 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. 0.92 per minute

B. 0.23 per minute

C. 0.69 per minute

D. 0.46 per minute

Answer: D

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359. The half - line period a radioactive element X is same as the mean life time of another radioactive element Y. Initially both of them have the same number of atoms. Then:

A. Y will decay at a faster rate than X

B. X will decay at a faster rate than Y

C. X and Y always decay at the same rate

D. X and Y have the same decay rate initially

Answer: A

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360. The radioactivity of a sample is A_1 at time t_1 and A_2 at time t_2 If the mean life of the specimen is T, the number of atoms that have disintegrated in the time interval of $(t_2 - t_1)$ is :

A. $R_1 t_1 - R_2 t_2$

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

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

D. $(R_1 - R_2)T$

Answer: D

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361. The half life of a radioactive substance is 24 days. What is the time interval $(t_2 - t_1)$ between the time t_2 when $\frac{2}{3}$ of the original material had decayed and time t_1 when $\frac{1}{3}$ of its original material has decayed ?

A. 24 days

B. 12 days

C. 36 days

D. 48 days

Answer: A

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362. Half-life of a radioactive substance A is $4 days$. The probability that a nuclear will decay in two half-lives is

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

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

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

D. 1

Answer: C

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363. Half-life of a radioactive substance A and B are, respectively, 20 min and 40 min . Initially, the samples of A and B have equal number of nuclei. After 80 min , the ratio of the ramaining number of A and B nuclei is

A. $1:1$

B. $1:4$

C. $4:1$

D. $1:16$

Answer: A

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

A. 4.20×10^9 years

B. 8.40×10^9 years

C. 1.90×10^9 years

D. 3.92×10^9 years

Answer: B

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365. 8 grams of a radioactive substance is reduced to 0.5 g after 1 hour . The $t_{1/2}$ of the radioactive substance is

A. 15 min

B. 30 min

C. 45 min

D. 10 min

Answer: A

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366. The graph of intensity of X rays from a coolidge tube against wavelength is as shown in the figure . The minimum wavelength is λ_m and the wavelength of the K_α line of the characteristic X ray spectrum is λ_K . If the accelerating voltage is increased , then

A. λ_K increases

B. λ_K decreases

C. $\lambda_K - \lambda_m$ decreases

D. $\lambda_K - \lambda_m$ increases

Answer: D

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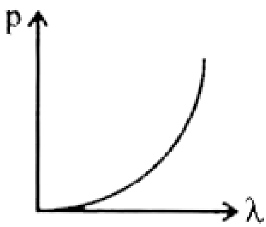
367. Which of the following graphs correctly represents the variation of particle momentum with associated de Broglie wavelength?

A. 

B.

C.

D.

Answer: C

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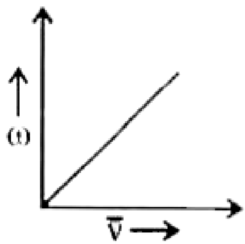
368. The graph between wave number $\left(\overrightarrow{v}\right)$ and angular frequency (ω) is

A. 

B.

C.

D.

Answer: B

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369. Linear momentum of an electron in Bohr obrit of H-atom (principal quantum number n) is proporational to

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

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

C. n

D. n^2

Answer: B

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370. The nuclei having the same number of protons but different number of neutrons are called

A. 1. Isobars

B. 2. α particles

C. 3. Isotopes

D. 4. γ particles

Answer: C

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371. When the electron in a hydrogen atom jumps from the second orbit to the first orbit , the wavelength of the radiation emitted is λ . When the electron jumps from the third orbit to the first orbit , of the same atom , the wavelength of the emitted radiation would be

A. $\frac{27}{32}\lambda$

B. $\frac{32}{27}\lambda$

C. $\frac{2}{3}\lambda$

D. $\frac{3}{2}\lambda$

Answer: A

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372. What is the de broglie wavelength of an electron moving with 1/3 of the speed of light in vaccum ? (Neglect the relativistic effect)

$\left[h = 6.63 \times 10^{-34} J.\, s\left(M_e = 9.11 \times 10^{-28} g\right)\right]$

A. a. $7.278 \times 10^{-12} m$

B. b. $6.782 \times 10^{-11} m$

C. c. $8.532 \times 10^{-11} m$

D. d. $9.728 \times 10^{-12} m$

Answer: A

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373. An electron of mass m has de broglie wavelength λ when accelerated through a potential difference V . When a proton of mass M is accelerated through a potential difference 9V, the de broglie wavelength associated with it will be (Assume that wavelength is determined at low voltage) .

A. a. $\frac{\lambda}{3}\sqrt{\frac{M}{m}}$

B. b. $\frac{\lambda}{3} \cdot \frac{M}{m}$

C. c. $\frac{\lambda}{3}\sqrt{\frac{m}{M}}$

D. d. $\frac{\lambda}{3} \cdot \frac{m}{M}$

Answer: C

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374. In Bohr's theory of hydrogen atom, the electron jumps from higher orbit n to lower orbit p. The wavelength will be minimum for the transition

A. n=5 to p=4

B. n=4 to p=3

C. n=3 to p=2

D. n=2 to p=1

Answer: D

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375. When an electron in hydrogen atom revolves in stationary orbit, it

A. Does not radiate light though its velocity changes

B. Does not radiate light and velocity remain unchanged

C. Radiates light but its velocity is unchanged

D. Radiates light with the change of energy

Answer: A

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376. The frequency for a series limit of Balmer and paschen serial respectively are f_1 and f_3 if the frequency of the first line of Balmer series is then the relation between f_1, f_2 and f_3 is

A. $v_1 - v_2 = v_3$

B. $v_1 + v_3 = v_2$

C. $v_1 + v_2 = v_3$

D. $v_1 - v_3 = 2v_1$

Answer: A

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377. A radioactive element has rate of disintegration $10,000$ disintegrations per minute at a particular instant. After four minutes it becomes 2500 disintegrations per minute. The decay constant per minute is

A. $0.2 \log_e 2$

B. $0.5 \log_e 2$

C. $0.6 \log_e 2$

D. $0.8 \log_e 2$

Answer: B

Watch Video Solution

378. If the electron in hydrogen atom jumps from second Bohr orbit to ground state and difference between energies of the two states is radiated in the form of photons. If the work function of the material is $4.2eV$, then stopping potential is

[Energy of electron in nth orbit $= -\frac{13.6}{n^2}eV$]

A. 2V

B. 4V

C. 6V

D. 8V

Answer: C

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379. According to de-Broglie hypothesis, the wavelength associated with moving electron of mass 'm' is $'\lambda_e'$. Using mass energy relation and Planck's quantum theory, the wavelength associated with photon is $'\lambda_p'$. If the energy (E) of electron and photonm is same, then relation between λ_e and $'\lambda_p'$ is

A. $\lambda_p \propto \lambda_e$

B. $\lambda_p \propto \lambda_e^2$

C. $\lambda_p \propto \sqrt{\lambda}_e$

D. $\lambda_p \propto \frac{1}{\lambda_e}$

Answer: A

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Test Your Grasp

1. According to Rutherford's atom model, the electrons revolving round the nucleus, should give rise to

A. 1. a line spectrum

B. 2. a band spectrum

C. 3. a continuous emission spectrum

D. 4. an absorption spectrum

Answer: C

Watch Video Solution

2. The velocity of an electron in the first Bohr orbit of hydrogen atom is $2.19 \times 10^6 ms^{-1}$. Its velocity in the second orbit would be

A. 1.1×10^6 m/s

B. 4.4×10^6 m/s

C. $\sqrt{2.2 \times 10^6}$ m/s

D. 1.1×10^3 m/s

Answer: A

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3. The radius of the orbital of electron in the hydrogen atom 0.5Å. The speed of the electron is $2 \times 10^6 m/s$. Then the current in the loop due to the motion of the electron is

A. 2 mA

B. 3 mA

C. 1 mA

D. $4 \times 10^{-3} A$

Answer: C

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4. 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 $21.2 \times 10^{-11} m$. The principal quantum number of the final state of the atom is.

A. n=16

B. n= 4

C. n=3

D. n=2

Answer: D

Watch Video Solution

5. 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. 3.2 E

B. 5.6 E

C. 7.2 E

D. 13.2 E

Answer: C

Watch Video Solution

6. The series limit of Balmer series is 6400 Å. The series limit of Paschen series will be

A. a. 3200 Å

B. b. 14400 Å

C. c. 12800 Å

D. d. 64000 Å

Answer: B

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7. An electron jumps from the 3rd orbit to the ground orbit in the hydrogen atom. If $R_H = 10^7$ /m then the frequency of the radiation emitted in the transition is

A. $\frac{8}{3} \times 10^{15}$ Hz

B. $\frac{4}{3} \times 10^{15}$ Hz

C. $\frac{9}{8} \times 10^{15}$ Hz

D. $\frac{7}{16} \times 10^{15}$ Hz

Answer: A

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8. If the following atoms and molecylates for the transition from $n = 2$ to $n = 1$, the spectral line of minimum wavelength will be produced by

A. Deuterium atom

B. Doubly ionized lithium

C. Hydrogen atom

D. Singly ionized helium

Answer: B

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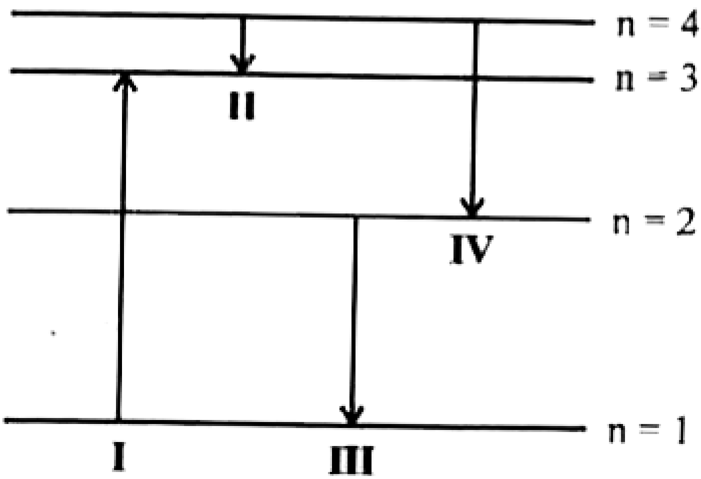
9. The diagram shows the energy levels for an electron in a certain atom.



Which transition shown in the diagram represents the emission of a photon with the maximum energy?

A. IV

B. III

C. II

D. I

Answer: B

View Text Solution

10. The de-Broglie wavelength of a particle having a momentum of $2 \times 10^{-28} kgm/s$ is

A. 3.3×10^{-5} m

B. $6.6 \times 10^{-6} m$

C. $3.3 \times 10^{-6} m$

D. $1.65 \times 10^{-6} m$

Answer: C

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11. What will be the ratio of de - Broglie wavelengths of proton and α - particle of same energy ?

A. $1:2$

B. $1:4$

C. $2:1$

D. $4:1$

Answer: C

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12. de-Broglie wavelength associated with an electron accelerated through a potential difference V is λ. What will be its wavelength when the accelerating potential is increased to 4V?

A. λ

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

C. 2λ

D. 1.5λ

Answer: B

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13. An electtron and a photon have same wavelength . If p is the moment of electron and E the energy of photons, the magnitude of p/E in S I unit is

A. 6.64×10^{-34}

B. 3.33×10^{-9}

C. 9.1×10^{-31}

D. 3×10^{8}

Answer: B

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14. An X ray tube is operated at an accelerating potential of 40 kV. What is the minimum wavelength of X rays produced1?

A. 0.62 Å

B. 0.31 Å

C. 0.45 Å

D. 0.75 Å

Answer: B

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15. A The wavelength of the K_α line ofthe characteristic X rays emitted by an element is 0.64 Å . What is the wavelength of K_β line emitted by the same element?

A. a. 0.18 Å

B. b. 0.27 Å

C. c. 0.54 Å

D. d. 0.72 Å

Answer: C

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16. In the following reaction.

$\cdot_{12} Mg^{24} + \cdot_{2} He^{4} \rightarrow \cdot_{14} Si^{X} + \cdot_{0} n^{1}, X$ is.

A. 28

B. 22

C. 27

D. 26

Answer: C

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17. The radius of germanium (Ge) nuclide is measured to be twice the radius of $._4^9 Be$. The number of nucleons in Ge are

A. 62

B. 72

C. 82

D. 85

Answer: B

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

A. $_{92}U^{235}$

B. $_{56}Ba^{141}$

C. ${}_2He^4$

D. ${}_{26}Fe^{56}$

Answer: D

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

A. 3.64

B. 3.52

C. 7.86

D. 4.23

Answer: D

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20. In any fission the ratio

$\dfrac{\text{mass of fission produts}}{\text{mass of parent nucleus}}$ is

A. Greater than 1

B. Less than 1

C. Depends on the mass of parent nucleus

D. Equal to 1

Answer: B

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21. During a nuclear fusion reaction,

A. a light nucleus bombarded by thermal neutrons breaks up

B. two light nuclei combine to give a heavier nucieus and possible other products

C. a heavy nucleus breaks into two fragments by itself

D. a heavy nucleus bombarded by thermal neutrons breaks up

Answer: B

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22. In the given reaction

$$._z X^A \rightarrow ._{z+1} Y^A \rightarrow ._{z-1} K^{A-4} \rightarrow ._{z-1} K^{A-4}$$

Radioactive radiations are emitted in the sequence.

A. γ, β, α

B. γ, α, β

C. α, β, γ

D. β, α, γ

Answer: D

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23. The radioactivity of a substance is measured in terms of disintegration per second. Then 3×10^{8} dps (disintegration per second) is equal to

A. a. 1eV

B. 1 MeV

C. 300 rutherford

D. 1 Curie

Answer: C

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24. The number of beta particles emitter by radioactive sustance is twice the number of alpha particles emitter by it. The resulting daughter is an

A. isotope of the parent nucleus

B. isotone of the parent nucleus

C. isomers of the parent nucleus

D. isobar of the parent nucleus

Answer: A

Watch Video Solution

25. How many alpha and beta particles are emitted when uranium $._{92}^{238} U$ decays to lead $._{82}^{206} Pb$?

A. 10,8

B. 8,6

C. 8,8

D. 6,8

Answer: B

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26. A radioactive sample with a half-life of 1 month has the label : 'Activity=

2 microcurie on 1-8-1991'. What would be its avtivity two months earlier?

A. 8 micro curie

B. 4 micro curie

C. 1 micro curie

D. 0.5 micro curie

Answer: A

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27. The half life of a radioactive material is 6.93 hour. After how many hours will only one-twentieth of the material be left over? Take $\log_e$ (20) = 3.0.

A. a. 15h

B. b. 20h

C. c. 25h

D. d. 30h

Answer: D

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28. Two radioactive substance 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 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. $\frac{1}{2\lambda}$

Answer: D

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29. A radioactive element A with a half-value period of 2 hours decays giving a stable element Y. After a time t the ratio of X and Y atoms is $1:7$ then t is :

A. 4 hours

B. 14 hours

C. 6 hours

D. Between 4 and 6 hour

Answer: C

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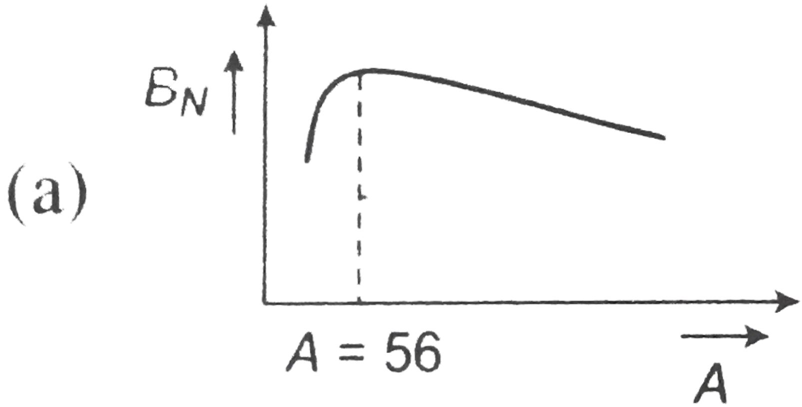
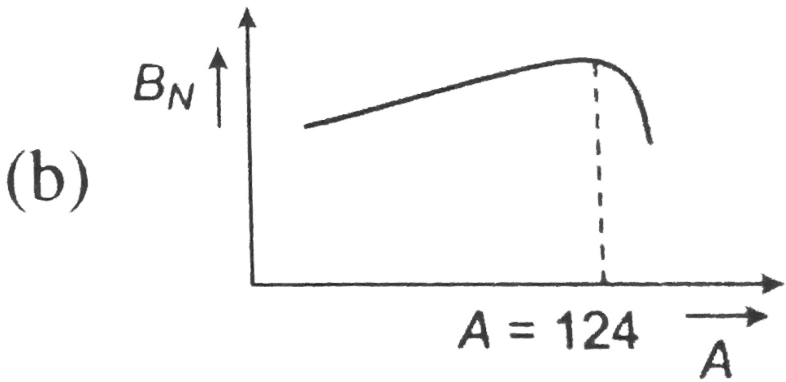
30. The dependence of binding energy per nucleon, B_N on the mass number, A is represented by.

(a) 

, (b) 

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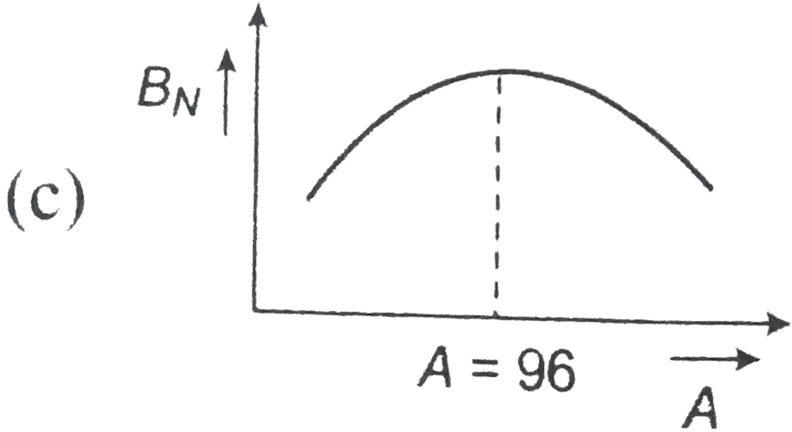
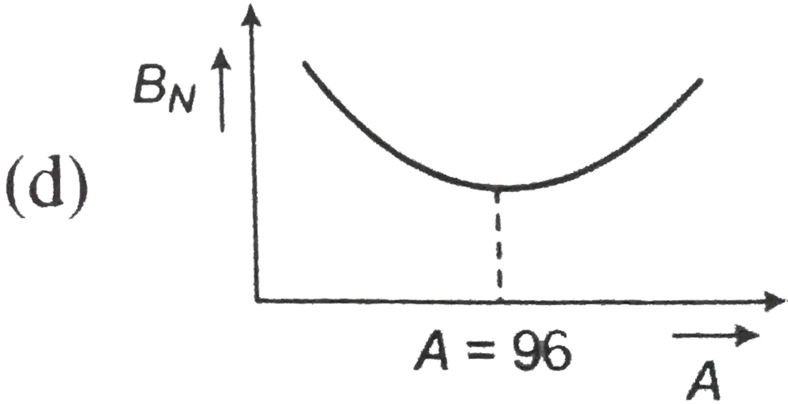


(c) , (d)



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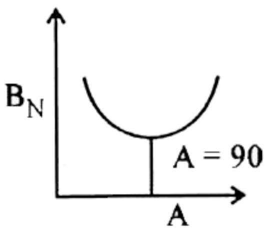
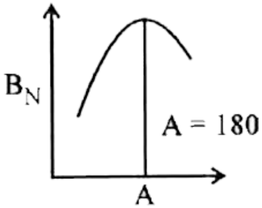
A.



B.

C.

D. 

Answer: C

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