PHYSICS

BOOKS - UNIVERSAL BOOK DEPOT 1960 PHYSICS (HINGLISH)

ATOMIC AND NUCLEAR PHYSICS

Exercise

1. If in nature they may not be an element for which the principle quantum number $n > 4$, then the total possible number of elements will be

A. 60

B. 32

C. 4

D. 64

Answer: A

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

A. n^{-1}

B. n

C. n^{-2}

D. n^2

Answer: D

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3. 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. $10.2 eV$

B. 12.1 eV

C. 13.6 eV

D. 3.4 eV

Answer: A

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4. 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. Hydrogen atom

B. Deuterium atom

C. Uni-ionized helium

D. di-ionized lithium

Answer: D

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5. The Lyman series of hydrogen spectrum lies in the region :

A. Infrared

B. Visible

C. Ultraviolet

D. of X - rays

Answer: C

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6. The size of an atom is of the order of

A. $10^{-8}m$

B. $10^{-10}m$

C. $10^{-12}m$

D. $10^{-14}m$

Answer: B

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7. Which one of the series of hydrogen spectrum is in the visible region ?

A. Lyman series

B. Balmer series

C. Paschen series

D. Bracket series 8

Answer: B

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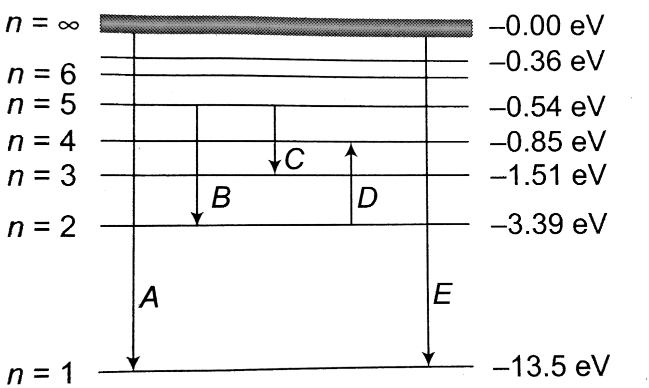
8. The energy levels of the hydrogen spectrum is shown in figure. There are some transitions A, B, C, D and E. Transition $A, B,$ and C respectively represent



A. First member of Lyman series, third spectral line of Balmer series and the second spectral line of Paschen series

B. Ionization potential of hydrogen, second spectral line of Balmer series and third spectral line of Paschen series

C. Series limit of Lyman series, third spectral line of Balmer series and second spectral line of Paschen series

D. Series limit of Lyman series, second spectral line of Balmer series and third spectral line of Paschen series

Answer: C

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9. In the figure of previous problem, D and E respectively represent

A. Absorption line of Balmer series and the ionization potential of hydrogen

B. Absorption line of Balmer series and the wavelength lesser than lowest of the Lyman series

C. Spectral line of Balmer series and the maximum wavelength of Lyman seri

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

Answer: A

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

A. Atom is hollow

B. The whole mass of the atom is concentrated in a small centre called nucleus

C. Nucleus is positively charged

D. All the above

Answer: D

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11. Which of the following is true?

A. Lyman series is a continuous spectrum

B. Paschen series is a line spectrum in the infrared

C. Balmer series is a line spectrum in the ultraviolet

D. The spectral series formula can be derived from the Rutherford model of the hydrogen atom

Answer: B

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12. The energy required to knock out the electron in the third orbit of a hydrogen atom is equal to

A. $13.6eV$

B. $+\frac{13.6}{9}eV$

C. $-\frac{13.6}{3}eV$

D. $-\frac{3}{13.6}eV$

Answer: B

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13. An electron has a mass of $9.1 \times 10^{-31} kg$. It revolves round the nucleus in a circular orbit of radius 0.529×10^{-10} metre at a speed of $2.2 \times 10^{6} m/s$. The magnitude of its linear momentum in this motion is

A. $1.1 \times 10^{-34} kg - m/s$

B. $2.0 \times 10^{-24} kg - m/s$

C. $4.0 \times 10^{-24} kg - m/s$

D. $4.0 \times 10^{-31} kg - m/s$

Answer: B

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14. In a beryllium atom, if a_0 be the radius of the first orbit, then the radius of the second orbit will be in general

A. na_0

B. a_0

C. $n^2 a_0$

D. $\frac{a_0}{n^2}$

Answer: C

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15. The ionization potential for second He electron is

A. 13.6 eV

B. 1.36 eV

C. 54.4 eV

D. 100 eV

Answer: C

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

A. 13.6 eV

B. 1.36 eV

C. 0.136 eV

D. 0.0136 eV

Answer: C

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17. Every series of hydrogen spectrum has an upper and lower limit in wavelength. The spectral series which has an upper limit of wavelegnth equal to 18752Å is

(Rydberg constant $R = 1.097 \times 10^7$ per metre)

A. Balmer series

B. Lyman series

C. Paschen series

D. Pfund series

Answer: C

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18. The kinetic energy of the electron in an orbit of radius r in hydrogen atom is ($e =$ electronic charge)

A. $\frac{e^2}{r^2}$

B. $\frac{e^2}{2r}$

C. $\frac{e^2}{r}$

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

Answer: B

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19. Ionization potential of hydrogen atom is $13.6V$. Hydrogen atoms in the ground state are excited by monochromatic radiation of photon energy $12.1 eV$. The spectral lines emitted by hydrogen atoms according to Bohr's theory will be

A. one

B. two

C. three

D. four

Answer: C

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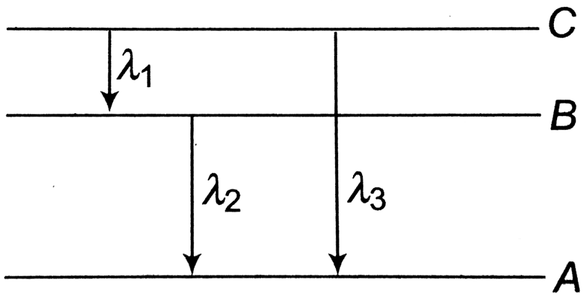
20. Energy levels A, B, C of a certain atom corresponding to increasing values of energy i.e., $E_A < E_B < E_C$. If $\lambda_1, \lambda_2, \lambda_3$ are the wavelengths of radiations corresponding to the transitions C to B, B to A and C to A respectively, which of the following statements is correct?



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

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

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

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

Answer: B

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21. The angular momentum of electron in n^{th} orbit is given by

A. nh

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

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

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

Answer: C

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22. The ratio of the energies of the hydrogen atom in its first to second excited state is

A. $1/4$

B. $4/9$

C. $9/4$

D. 4

Answer: C

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

B. $\frac{3}{16} \times 10^{15}$

C. $\frac{9}{16} \times 10^{15}$

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

Answer: C

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24. The ionisation potential of hydrogen atom is 13.6 volt. The energy required to remove an electron in the $n = 2$ state of the hydrogen atom is

A. 27.2 eV

B. 13.6 eV

C. 6.8 eV

D. 3.4 eV

Answer: D

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25. The ionisation energy of 10 times innised sodium atom is

A. $13.6eV$

B. $13.6 \times 11eV$

C. $\frac{13.6}{11}eV$

D. $13.6 \times (11)^2 eV$

Answer: D

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26. 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. $13122Å$

B. $3280Å$

C. $4860Å$

D. $2187Å$

Answer: C

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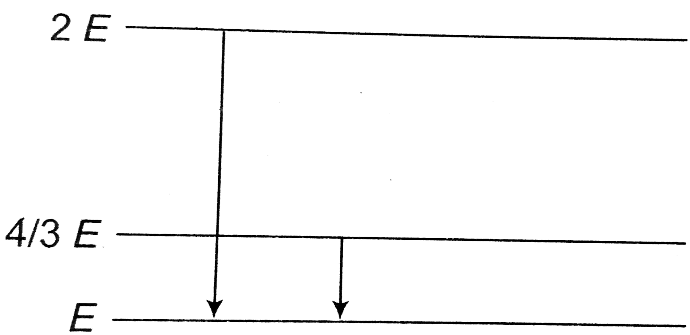
27. The follwing diagram indicates the energy levels of a certain atom when the system moves from $2E$ level to E, a photon of wavelength λ is emitted. The wavelength of photon produced during its transition from $\frac{4E}{3}$ level to E is



A. $\lambda / 3$

B. $3\lambda / 4$

C. $4\lambda / 3$

D. 3λ

Answer: D

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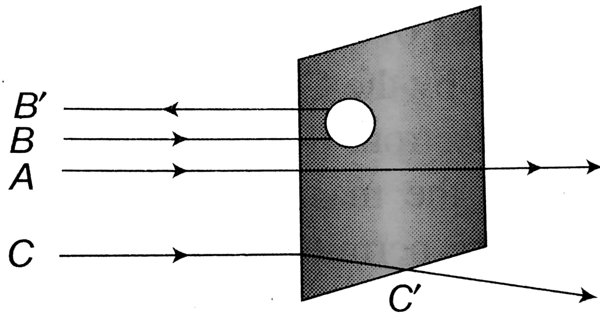
28. A beam of fast moving alpha particles were directed towards a thin film of gold. The parts A', B' and C' of the transmitted and refected beams correcponding ro the incident parts A, B and C of the beam, are shown in the adjoining diagram. The number of alpha particles in



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

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

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

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

Answer: B

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29. According to Bohr's theory the radius of electron in an orbit described by principle quantum number n and atomic number Z is proportional to

A. Z^2n^2

B. $\frac{Z^2}{n^2}$

C. $\frac{Z^2}{n}$

D. $\frac{n^2}{Z}$

Answer: D

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30. The radius of electron's second stationary orbit in Bohr's atom is R. The radius of the third orbit will be

A. 3 R

B. 2.25 R

C. 9 R

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

Answer: B

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31. If m is mass of electron, v its velocity, r the radius of stationary circular orbit around a nucleus with charge Z_e, then from Bohr's first postulate, the kinetic energy $k = \frac{1}{2}mv^2$ of the electron in $C.G.S.$ system is equal to

A. $\frac{1}{2}\frac{Ze^2}{r}$

B. $\frac{1}{2}\frac{Ze^2}{r^2}$

C. $\frac{Ze^2}{r}$

D. $\frac{Ze}{r^2}$

Answer: A

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32. Consider an eelctron in the nth orbit of a hydrogen atom in the Bohr model. The circumference of the orbit can be expressed in terms of the de Broglie wavelength λ o fthat electron as

A. $(0.259)n\lambda$

B. $\sqrt{n}\lambda$

C. $(13.6)\lambda$

D. $n\lambda$

Answer: D

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33. In any Bohr orbit of the hydrogen atom, the ratio of kinetic energy to potential eenrgy of the electron is

A. $1/2$

B. 2

C. $-1/2$

D. -2

Answer: C

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

A. Balmer series

B. Pfund series

C. Paschen series

D. Lyman series

Answer: D

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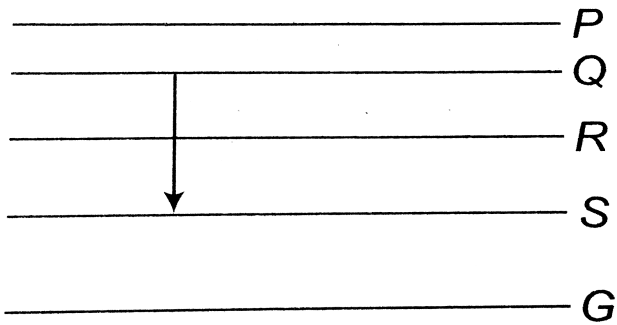
35. Figure shows the enegry levels P, Q, R, S and G of an atom where G is the ground state. A red line in the emission spectrum of the atom can be obtaned by an energy level change from Q so S. A blue line can be obtained by following energy level change



A. P to Q

B. Q to R

C. R to S

D. R to G

Answer: D

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36. A hydrogen atom (ionisation potential $13.6eV$) makes a transition from third excited state to first excied state. The enegry of the photon emitted in the process is

A. 1.89 eV

B. 2.55 eV

C. 12.09 eV

D. 12.75 eV

Answer: B

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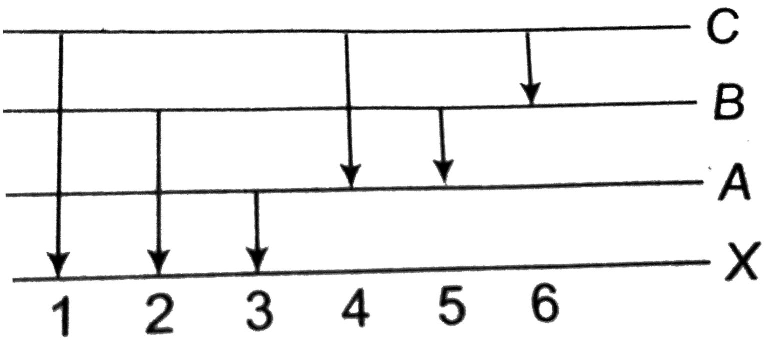
37. The figure indicates the enegry level diagram of an atom and the origin of six spectral lines in emission (e.g. line no.5 series from the transition from level B to A). The following spectral lines will also occur in the absorption spectrum



A. 1, 4, 6

B. 4, 5, 6

C. 1, 2, 3

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

Answer: C

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

A. P.E. increases and K.E. decreases

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

C. Both kinetic energy and potential energy increase

D. Both K.E. and P.E. decrease

Answer: A

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39. An electron makes a transition from orbit $n = 4$ to the orbit $n = 2$ of a hydrogen atom. The wave number of the emitted radiations $(R =$ Rydberg's constant) will be

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

B. $\frac{2R}{16}$

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

D. $\frac{4R}{16}$

Answer: C

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40. In Bohr model of the hydrogen atom, the lowest orbit corresponds to

A. Infinite energy

B. The maximum energy

C. The minimum energy

D. Zero energy

Answer: C

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41. The ratio of kinetic energy to the total energy of an electron in a Bohr orbit of the hydrogen atom, is

A. -1

B. 2

C. $1:2$

D. None of these

Answer: A

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42. An electron in the $n=1$ orbit of hydrogen atom is bound by $13.6eV$. If a hydrogen atom I sin the $n = 3$ state, how much energy is required to ionize it

A. 13.6 eV

B. 4.53 eV

C. 3.4 eV

D. 1.51 eV

Answer: D

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

A. Acceleration of electron in $n = 2$ orbit is less than that in $n = 1$ orbi

B. Angular momentum of electron in $n = 2$ orbit is more than that in $n = 1$ orbit

C. Kinetic energy of electron in $n = 2$ orbit is less than that in $n = 1$ orbi

D. Potential energy of electron in $n = 2$ orbit is less than that in $n = 1$ orbit

Answer: D

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44. If an electron jumps from 1st orbital to 3rd orbital, than it will.

A. Absorb energy

B. Release energy

C. No gain of energy

D. None of these

Answer: A

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45. The ratio of the frequencies of the long wavelenght limits of Lyman and Balmer series of hydrogen spectrum is

A. $27:5$

B. $5 : 27$

C. $4 : 1$

D. $1 : 4$

Answer: A

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

A. $n=1 \text{ to } n=2$

B. $n=2 \text{ to } n=1$

C. $n=2 \text{ to } n=6$

D. $n=6 \text{ to } n=2$

Answer: A

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

A. R

B. 3 R

C. $\frac{5R}{36}$

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

Answer: C

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48. If the ionisation potential of helium atom is 24.6 volt, the energy required to ionise it will be

A. 24.6 eV

B. 24.6 eV

C. 13.6 V

D. 13.6 eV

Answer: A

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49. Which of the transitions in hydrogen atom emits a photon of lowest frequecny $(n =$ quantum number)?

A. $n=2 \text{ to } n=1$

B. $n=4 \text{ to } n=3$

C. $n=3 \text{ to } n=1$

D. $n=4 \text{ to } n=2$

Answer: B

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50. According to Bohr's theory, the expression for the kinetic and potential eenrgy of an electron revolving in an orbit is given respectively by

A. $+\frac{e^2}{8\pi\varepsilon_0 r}$ and $\frac{e^2}{4\pi\varepsilon_0 r}$

B. $+\frac{8\pi\varepsilon_0 e^2}{r}$ and $-\frac{4\pi\varepsilon_0 e^2}{r}$

C. $-\frac{e^2}{8\pi\varepsilon_0 r}$ and $-\frac{e^2}{4\pi\varepsilon_0 r}$

D. $+\frac{e^2}{8\pi\varepsilon_0 r}$ and $+\frac{e^2}{4\pi\varepsilon_0 r}$

Answer: A

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51. In the lowest energy level of hydrogen atom, the electron has the angular momentum

A. π / h

B. h / π

C. $h / 2\pi$

D. $2\pi / h$

Answer: C

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52. The minimum enegry required to excite a hydrogen atom from its ground state is

A. 13.6 eV

B. $-13.6eV$

C. 3.4 eV

D. 10.2 eV

Answer: D

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53. Ratio of the wavelength of first line of Lyaman series and first line of Balmer series is

A. $1:3$

B. $27:5$

C. $5:27$

D. $4:9$

Answer: C

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54. The Rydberg constant R for hydrogen is

A. $R = -\left(\frac{1}{4\pi\varepsilon_0}\right)\cdot\frac{2\pi^2 me^2}{ch^2}$

B. $R = \left(\frac{1}{4\pi\varepsilon_0}\right)\cdot\frac{2\pi^2 me^4}{ch^2}$

C. $R = \left(\frac{1}{4\pi\varepsilon_0}\right)^2\cdot\frac{2\pi^2 me^4}{c^2h^2}$

D. $R = \left(\frac{1}{4\pi\varepsilon_0}\right)^2\cdot\frac{2\pi^2 me^4}{ch^3}$

Answer: D

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55. The wavelength of the first line of Balmer series is 6563Å. The Rydbergs constant fro hydrogen is about

A. 1.09×10^7 per m

B. $1.09 \times 10^8 perm$

C. $1.09 \times 10^9 perm$

D. $1.09 \times 10^5 perm$

Answer: A

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56. According to Bohr's theory the moment of momentum of an electron revolving in second orbit of hydrogen atom will be

A. $2\pi h$

B. πh

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

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

Answer: C

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57. The velocity of an electron in the second orbit of sodium atom (atomic number $= 11$) is v. The velocity of an electron in its fifth orbit will be

A. v

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

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

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

Answer: D

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58. 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. 4

C. 5

D. 6

Answer: D

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

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

B. $\frac{524}{376}$

C. 25

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

Answer: D

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60. 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. 0

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

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

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

Answer: C

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61. The electron in a hydrogen atom makes a transition $n_1 \rightarrow n_2$, where n_1 and n_2 are the principle quantum numbers of the two states. Assume the Bohr model to be valid. The time period of the electron in the initial state is eight times that in the final state. the possible values of n_1 and n_2 are

A. $n_1 = 4, n_2 = 2$

B. $n_1 = 8, n_1 = 2$

C. $n_1 = 8, n_2 = 1$

D. $n_1 = 6, n_2 = 3$

Answer: A::D

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62. 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. 1.51

B. 13.6

C. 40.8

D. 122.4

Answer: D

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63. In Bohr's model of hydrogen atom, let PE represents potential energy and TE the total energy. In going to a higher level

A. PE decreases, TE increases

B. PE increases, TE increases

C. PE decreases, TE decreases

D. PE increases, TE decreases

Answer: B

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

A. 0.53Å

B. 1.06Å

C. 2.12Å

D. 0.265Å

Answer: B

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65. The fact that photons carry energy was established by

A. Doppler's effect

B. Compton's effect

C. Bohr's theory

D. Diffraction of light

Answer: C

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66. An ionic atom equivalent to hydrogen atom has wavelength equal to $1/4$ of the wavelengths of hydrogen lines. The ion will be

A. He^{+}

B. Li^{++}

C. Ne^{9+}

D. Na^{10+}

Answer: A

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67. The extreme wavelength of Paschen series are

A. $0.365\mu m$ and $0.565\mu m$

B. $0.818\mu m$ and $1.89\mu m$

C. $1.45\mu m$ and $4.04\mu m$

D. $2.27\mu m$ and $7.43\mu m$

Answer: B

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68. The third line of Balmer series of an ion equivalent to hydrogen atom has wavelength of $108.5mm$. The ground state energy of an electron of this ion will e

A. 3.4 eV

B. 13.6 eV

C. 54.4 eV

D. 122.4 eV

Answer: C

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69. An electron in the $n = 1$ orbit of hydrogen atom is bound by $13.6 eV$ energy is required to ionize it is

A. 13.6 eV

B. 6.53 eV

C. 5.4 eV

D. 1.51 eV

Answer: A

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70. Ionization energy of hydrogen is $13.6eV$. If $h = 6.6 \times 10^{-34} J - s$, the value of R will of the order of

A. $10^{10m^{-1}}$

B. $10^7 m^{-1}$

C. $10^4 m^{-1}$

D. $10^{-7} m^{-1}$

Answer: B

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71. To explain his theory, Bohr used

A. Conservation of linear momentum

B. Conservation of angular momentum

C. Conservation of quantum frequency

D. Conservation of energy

Answer: B

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72. The ionisation energy of hydrogen atom is $13.6 eV$. Following Bohr's theory, the energy corresponding to a transition between the 3rd and the 4th orbit is

A. 3.40 eV

B. 1.51 eV

C. 0.85 eV

D. 0.66 eV

Answer: D

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73. Hydrogen atoms are excited from ground state of the principle quantum number 4. Then the number of spectral lines observed will be

A. 3

B. 6

C. 5

D. 2

Answer: B

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74. Hydrogen atom emits blue light when it changes from $n = 4$ energy level to the $n = 2$ level. Which colour of light would te atom emit when it changes from the $n = 5$ level to the $n = 2$ level ?

A. Red

B. Yellow

C. Green

D. Violet

Answer: D

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75. In Rutherford scattering experiment, what will b ethe correct angle for α scattering for an impact parameter $b = 0$?

A. 90°

B. 270°

C. 0°

D. 180°

Answer: D

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76. The radius of hydrogen atom in its ground state is $5.3 \times 10^{-11} m$. After collision with an electron it is found to have a radius of $21.2 \times 10^{-11} m$. What is the principle quantum number of n of the final state of the atom ?

A. $n = 4$

B. $n = 2$

C. $n = 16$

D. $n = 3$

Answer: B

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

A. Zeeman's effect

B. Bohr's effect

C. Heisenberg's effect

D. Magnetic effect

Answer: A

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78. The energy of a hydrogen atom in its ground state is $-13.6eV$. The energy of the level corresponding to the quantum number

$n = 2$ (first excited state) in the hydrogen atom is

A. $-2.72eV$

B. $-0.85eV$

C. $-0.54eV$

D. $-3.4eV$

Answer: D

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79. The first line of Balmer series has wvaelength 6563Å. What will be the wavelength of the ifrst member of Lyman series?

A. 1215.4Å

B. 2500Å

C. 7500Å

D. 600Å

Answer: A

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80. The wavelength of Lyman series is

A. $\frac{4}{3 \times 10967} cm$

B. $\frac{3}{4 \times 10967} cm$

C. $\frac{4 \times 10967}{3} cm$

D. $\frac{3}{4} \times 10967 cm$

Answer: A

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81. When hydrogen atom is in first excited level, its radius is....its ground state radius

A. Half

B. Same

C. Twice

D. Four times

Answer: B

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82. Hydrogen atom excites energy level from fundamental state to $n = 3$. Number of spectrum lines according to Bohr, is

A. 4

B. 3

C. 1

D. 2

Answer: B

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83. Number of spectral lines in hydrogen atom is

A. 3

B. 6

C. 15

D. Infinite

Answer: D

84. In Bohr's model, if the atomic radius of the first orbit is r_0, then the radius of the fourth orbit is

A. $\frac{r_0}{9}$

B. r_0

C. $9r_0$

D. $3r_0$

Answer: C

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85. The wavelength of the energy emitted when electron come from fourth orbit to second orbit in hydrogen is $20.397 cm$. The wavelength of energy for the same transition in He^{+} is

A. $5.099 cm^{-1}$

B. $20.497 cm^{-1}$

C. $40.994 cm^{-1}$

D. $81.988 cm^{-1}$

Answer: A

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

A. 13.6 V

B. 3.4 V

C. 10.2 V

D. 3.6 V

Answer: C

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87. Which of the following statement is true regarding Bohr's model of hydrogen atom ?

(I) Orbiting speed of electrons decreases as if falls to discrete orbits away from the nuclues.

(II) Radii of allowed orbits of electrons are proportional to the principle quantum number.

(III) Frequency with which electrons orbit around the nucleus in discrete orbits is inversely proportional to the principle quantum number.

(IV) Binding froce with which the elctron is bound to the nuclues increases as it shifts to outer orbits.

Selected the correct answer using the codes given below:

A. I and III

B. II and IV

C. I, II and III

D. II, III and IV

Answer: A

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88. The wavelength of radiation emitted is λ_0 when an electron jumps from the third to the second orbit of hydrogen atom. For the electron jump from the fourth to the second orbit of hydrogen atom, the wavelength of radiation emitted will be

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

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

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

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

Answer: B

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89. For electron moving in n^{th} orbit of the atom , the angular velocity is proportional to:

A. n

B. $1/n$

C. n

D. $1/n$

Answer: D

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

A. $-3.4eV$

B. $+3.4eV$

C. $-6.8eV$

D. $6.8eV$

Answer: B

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

A. $1.602 \times 10^{-14} J$

B. $1.619 \times 10^{-16} J$

C. $1.632 \times 10^{-18} J$

D. $1.656 \times 10^{-20} J$

Answer: C

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

A. Radio active decay

B. Isotopes

C. Spectral lines

D. $\alpha -$ particles scattering

Answer: C

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93. Which of the following spectral series in hydrogen atom give spectral line of 4860Å

A.) Lyman

B. Balmer

C. Paschen

D. Brackett

Answer: B

Watch Video Solution

94. If scattering particles are 56 for 90° angle than this will be at 60° angle

A. 224

B. 256

C. 98

D. 108

Answer: A

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95. When an electron in hydrogen atom is excited, from its 4th to $5$the stationary orbit, the change in angular momentum of electron is (Planck's constant: $h = 6.6 \times 10^{-34} J - s$)

A. $4.16 \times 10^{-34} J - s$

B. $3.32 \times 10^{-34} J - s$

C. $1.05 \times 10^{-34} J - s$

D. $2.08 \times 10^{-34} J - s$

Answer: C

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96. Energy of electron in a orbit of H -atom is

A. Positive

B. Negative

C. Zero

D. Nothing can be said

Answer: B

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97. In a hydrogen atom, the distance between the electron and proton is $2.5 \times 10^{-11} m$. The electricl force of attraction between then will be

A. $2.8 \times 10^{-7} N$

B. $3.7 \times 10^{-7} N$

C. $6.2 \times 10^{-7} N$

D. $9.1 \times 10^{-7} N$

Answer: B

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98. If $\lambda_{\max}$ is 6563Å, then wave length of second line of Balmer series will be

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

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

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

D. None of these

Answer: A

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99. What will be the angular momentum of an electron, if energy of this electron in H-atom is $1.5eV$ (in $J - s$)?

A. 1.05×10^{-34}

B. 2.1×10^{-34}

C. 3.15×10^{-34}

D. -2.1×10^{-34}

Answer: C

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100. The time of revolution of an electron around a nucleus of charge Ze in nth Bohr orbit is directly proportional to

A. n

B. $\dfrac{n^3}{Z^2}$

C. $\dfrac{n^2}{Z}$

D. $\dfrac{Z}{n}$

Answer: B

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101. In Bohr's model, if the atomic radius of the first orbit is r_0, then the radius of the fourth orbit is

A. r_0

B. $4r_0$

C. $r_0 / 16$

D. $16r_0$

Answer: D

Watch Video Solution

102. If R is the Rydberg's constant for hydrogen the wave number of the first line in the Lyman series will be

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

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

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

D. $2R$

Answer: B

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103. In hydrogen atom, if the difference in the energy of the electron in $n = 2$ and $n = 3$

orbits is E, the ionization energy of hydrogen atom is

A. $13.2E$

B. $7.2E$

C. 5.6 E

D. 3.2 E

Answer: B

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104. The first member of the paschen series in hydrogen spectrum is of wavelength $18, 800 \text{Å}$. The short wavelength limit of Paschen series is

A. 1215Å

B. 6560Å

C. 8225Å

D. 12850Å

Answer: C

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105. The ratio of the largest to shortest wavelength in Lyman series of hydrogen spectra is

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

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

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

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

Answer: D

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106. In Bohr model of hyrogen atom, the ratio of periods of revolution of an electon in $n = 2$ and $n = 1$ orbit is

A. $2 : 1$

B. $4 : 1$

C. $8 : 1$

D. $16 : 1$

Answer: C

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107. The ratio of the longest to shortest wavelength in Brackett series of hydrogen spectra is

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

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

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

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

Answer: A

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108. The electron in a hydrogen atom makes a transition from an excited state to the ground state. Which of the following statements is true?

A. Its kinetic energy increases and its potential and total energies decrease

B. Its kinetic energy decreases, potential energy increases and its total energy remains the same

C. Its kinetic and total energies decrease and its potential energy increases

D. Its kinetic, potential and total energies decreases

Answer: A

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

A. $5:9$

B. $5:36$

C. $1:4$

D. $3:4$

Answer: A

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110. The radius of the Bohr orbit in the ground state of hydrogen atom is 0.5Å. The radius o fifth orbit of the electron in the third excited state of He^{+} will be

A. 8Å

B. 4Å

C. 0.5Å

D. 0.25Å

Answer: B

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111. The ratio of the speed of the electron in the first Bohr orbit of hydrogen and the speed of light is equal to (where e, h and c have their usual meanings)

A. $2\pi hc / e^2$

B. $e^2 h / 2\pi c$

C. $e^2 c / 2\pi h$

D. $2\pi e^2 / hc$

Answer: D

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112. According to the Rutherford's atomic model, the electrons inside the atom are

A. Stationary

B. Not stationary

C. Centralized

D. None of these

Answer: B

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113. The energy of hydrogen atom in its ground state is $-13.6eV$. The energy of the level corresponding to the quantum number n is equal 5 is

A. $-5.40eV$

B. $-2.72eV$

C. $-0.85eV$

D. $-0.54eV$

Answer: D

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114. According to classical theory, the circular path of an electron in Rutherford atom is

A. Spiral

B. Circular

C. Parabolic

D. Straight line

Answer: A

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115. Rutherford's a particle experiment showed that the atoms have

A. Proton

B. Nucleus

C. Neutron

D. Electrons

Answer: B

Watch Video Solution

116. Orbital acceleration of electron is

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

B. $\frac{n^2 h^2}{2n^2 r^3}$

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

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

Answer: A

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

A. Increases

B. Decreases

C. Unchanged

D. May decreases or increases

Answer: B

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118. The wavelength of yellow line of sodium is 5896Å. Its wave number will be

A. 50883×10 per second

B. 16961 per cm

C. 17581 per cm

D. 50883 per cm

Answer: B

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119. Radius of the first orbit of the electron in a hydrogen atom is 0.53Å . So, the radius of the third orbit will be

A. 2.12Å

B. 4.77Å

C. 1.06Å

D. 1.59Å

Answer: B

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

A. $\frac{2}{9}\lambda$

B. $\frac{9}{2}\lambda$

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

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

Answer: D

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121. In hydrogen atom which quantity is integral multiple of $\frac{h}{2\pi}$

A. Angular momentum

B. Angular velocity

C. Angular acceleration

D. Momentum

Answer: A

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122. In the following transitions, which one has higher frequency ?

A. $3-2$

B. $4-3$

C. $4-2$

D. $3-1$

Answer: D

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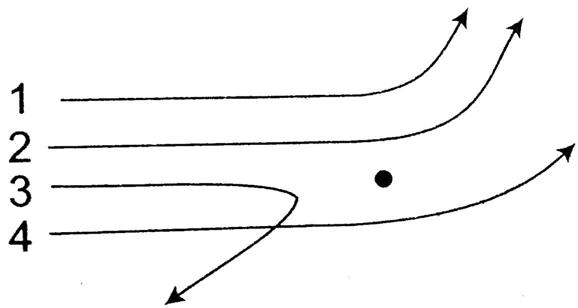
123. The diagram shown the path of four α-particles of the same energy being scattered by the nucleus of an atom simutaneously. Which of these are/is not physically possible ?



A. 3 and 4

B. 2 and 3

C. 1 and 4

D. 4 only

Answer: D

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124. An electron jumps from $5th$ orbit to $4th$ orbit of hydrogen atom. Taking the Rydberg constant as 10^7 per meter. What will be the frequency of radiation emitted ?

A. $6.75 \times 10^{12} Hz$

B. $6.75 \times 10^{14} Hz$

C. $6.75 \times 10^{13} Hz$

D. None of these

Answer: C

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125. For principle quantum number $n = 3$, the possible values of orbital quantum number 'l' are

A. 1, 2, 3

B. 0, 1, 2, 3

C. 0, 1, 2

D. $-1, 0, +1$

Answer: C

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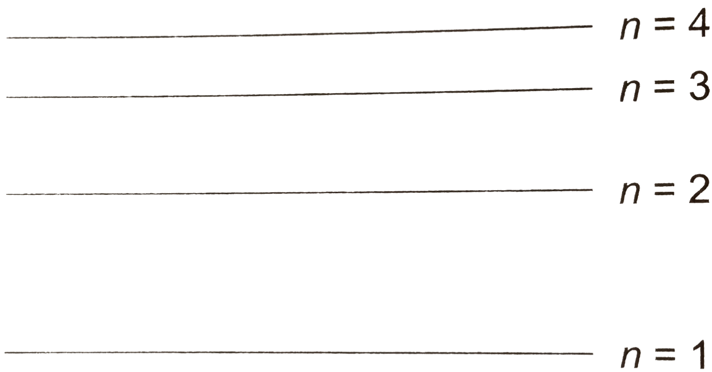
126. Four lowest energy levels of H-atom are shown in the figure. The number of possoble emission lines would be



A. 3

B. 4

C. 5

D. 6

Answer: D

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127. Energy of an electron in an excited hydrogen atom is $-3.4eV$. Its angualr momentum will be: $h = 6.626 \times 10^{-34} J - s$.

A. $1.11 \times 10^{34} J \sec$

B. $1.51 \times 10^{-31} J \sec$

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

D.

Answer: C

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

A. $1.215 \times 10^{-7} m$

B. $1.215 \times 10^{-5} m$

C. $1.215 \times 10^{-4} m$

D. $1.215 \times 10^{-3} m$

Answer: A

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129. 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. 13.6 eV

B. 3.4 eV

C. 12.09 eV

D. 1.51 eV

Answer: C

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130. Whenever a hydrogen atom emits a photon in the Balmer series

A. It need not emit any more photon

B. It may emit another photon in the Paschen series

C. It must emit another photon in the Lyman series

D. It may emit another photon in the Balmer series

Answer: C

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131. The de-Broglie wavelength of an electron in the first Bohr orbit is

A. Equal to one fourth the circumference of the first orbit

B. Equal to half the circumference of the first orbit

C. Equal to twice the circumference of the first orbit

D. Equal to the circumference of the first orbit

Answer: D

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132. In hydrogen atom, when electron jupms from second to first orbit, then enrgy emitted is

A. $-13.6eV$

B. $-27.2eV$

C. $-6.8eV$

D. None of these

Answer: D

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133. Minimum energy required to takeout the only one electron from ground state of He^{+} is

A. 13.6 eV

B. 54.4 eV

C. 27.2 eV

D. 6.8 eV

Answer: B

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134. The frequency of 1st line Balmer series in H_2 atom is v_0. The frequency of line emitted by single ionised He atom is

A. $2v_0$

B. $4v_0$

C. $v_0/2$

D. $v_0/4$

Answer: B

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135. When the elecrton in the hydrogen atom jupms from $2nd$ orbit to 1st orbit, the wavelength of radiation emitted is λ. When the electrons jupms from $3rd$ orbit to $1st$ orbit, the wavelength of 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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136. The radius of the first (lowest) orbit of the hydrogen atom is a_0. The radius of the second (next higher) orbit will be

A. $4a_0$

B. $6a_0$

C. $8a_0$

D. $10a_0$

Answer: A

Watch Video Solution

137. Which of the following transitions will have highest emission wavelength ?

A. $n = 2 \text{ to } n = 1$

B. $n = 1 \text{ to } n = 2$

C. $n = 2 \text{ to } n = 5$

D. $n = 5 \text{ to } n = 2$

Answer: D

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138. When the wave of hydrogen atom comes from infinity into the first then the value of wave number is

A. 109700 cm

B. 1097 cm

C. 109 cm

D. None of these

Answer: A

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139. With the increase in peinciple quantum number, the energy difference between the two successive energy levels

A. Increases

B. Decreases

C. Remains constant

D. Sometimes increases and sometimes decreases

Answer: B

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140. In which of the following systems will the radius of the first orbit $(n = 1)$ be minimum ?

A. Single ionized helium

B. Deuterium atom

C. Hydrogen atom

D. Doubly ionized lithium

Answer: D

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141. 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. 122.4 eV

B. 30.6 eV

C. 13.6 eV

D. 3.4 eV

Answer: B

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

A. 3648Å

B. 8208Å

C. 1228Å

D. 6566Å

Answer: A

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143. Energy E of a hydrogen atom with principle quantum number n is given by $E = \frac{-13.6}{n^2} eV$. The energy of a photon ejected when the electron jumps from $n = 3$ state to $n = 2$ state of hydrogen is approximately

A. 1.5 eV

B. 0.85 eV

C. 3.4 eV

D. 1.9eV

Answer: D

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144. The Bohr model of atoms

A. Assumes that the angular momentum of electrons is quantized

B. Uses Einstein's photo-electric equation

C. Predicts continuous emission spectra for atoms

D. Predicts the same emission spectra for all types of atoms

Answer: A

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145. Which state of triply ionised Beryllium (Be^{+++}) the same orbital radius as that of the ground state hydrogen ?

A. $n = 4$

B. $n = 3$

C. $n = 2$

D. $n = 1$

Answer: C

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146. The ratio of areas within the elctron orbits for the first excited state to the ground sate for hydrogen atom is

A. $16:1$

B. $18:1$

C. $4:1$

D. $2:1$

Answer: D

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147. Taking Rydberg's constant $R_H = 1.097 \times 10^7 m$ first and second wavelength of Balmer series in hydrogen spectrum is

A. $2000\text{Å}, 3000\text{Å}$

B. $1575\text{Å}, 2960\text{Å}$

C. $6529\text{Å}, 4280\text{Å}$

D. $6552\text{Å}, 4863\text{Å}$

Answer: D

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148. The kinetic energy of electron in the first Bohr orbit of the hydrogen atom is

A. $-6.5eV$

B. $-27.2eV$

C. $13.6eV$

D. $-13.6eV$

Answer: C

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149. In the spectrum of hydrogen atom, the ratio of the longest wavelength in Lyman series to the longest wavelangth in the Balmer series is:

A. $5/27$

B. $1/93$

C. $4/9$

D. $3/2$

Answer: A

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150. The energy of the highest enegry photon of Blamer series of hydrogen spectrum is close to

A. 13.6 eV

B. 3.4 eV

C. 1.5 eV

D. 0.85 eV

Answer: B

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151. An electron changes its position from orbit $n = 4$ to the orbit $n = 2$ of an atom. The wavelength of the emitted radiation's is $(R =$ Rydberg's constant)

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

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

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

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

Answer: B

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152. If the energy of a hydrogen atom in nth orbit is E_n, then energy in the nth orbit of a singly ionised helium atom will be

A. $4E_n$

B. $E_n/4$

C. $2E_n$

D. $E_n/2$

Answer: A

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153. 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. $20 : 27$

C. $20:25$

D. $25:27$

Answer: B

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

A. $910\text{Å}, 1213\text{Å}$

B. $5463\text{Å}, 7858\text{Å}$

C. $1315\text{Å}, 1530\text{Å}$

D. None of these

Answer: A

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

A. $0eV$

B. $-27.2eV$

C. $1eV$

D. $2eV$

Answer: B

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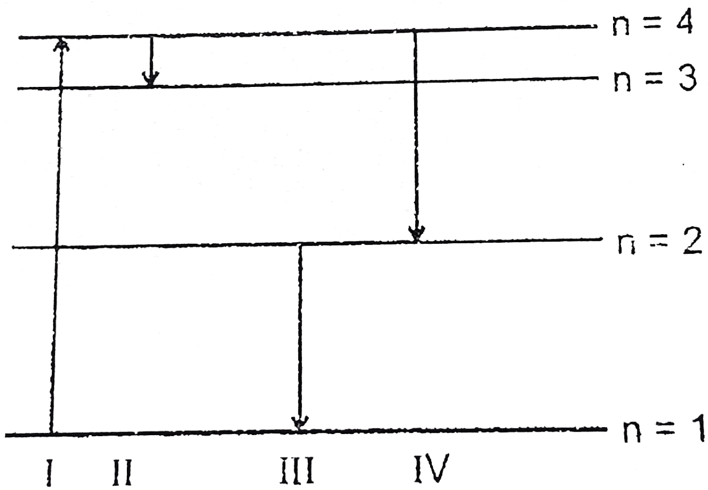
156. The diagram shows the energy levels for an electron in a certain atom. Which transition shown represents the emission of photon with the most enegy ?



A. I

B. II

C. III

D. IV

Answer: C

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157. 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 two-fold, U four-fold

B. K four-fold, U two-fold

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

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

Answer: C

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158. The magntic moment (μ) of a revolving electron around the mucleaus varies with principle quantum number n as

A. $\mu \propto n$

B. $\mu \propto 1/n$

C. $\mu \propto n^2$

D. $\mu \propto 1/n^2$

Answer: A

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159. Bohr's atomic model assumes

A. The nucleus is of infinite mass and is at res

B. Electrons in a quantized orbit will not radiate energy

C. Mass of electron remains constant

D. All the above conditions

Answer: D

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160. Which of the following particles are constituents of the nucleus

A. Protons and electrons

B. Protons and neutrons

C. Neutrons and electrons

D. Neutrons and positrons

Answer: B

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161. The particles which can be added to the nucleus of an atom without changing its chemical properties are

A. Electrons

B. Protons

C. Neutrons

D. None of the above

Answer: C

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162. The mass number of a nucleus is.

A. Always less than its atomic number

B. Always more than its atomic number

C. Always equal to its atomic number

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

Answer: D

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163. The energy equivalent of 1 kilogram of matter is about

A. $10^{-15}J$

B. $1J$

C. $10^{-12}J$

D. $10^{17}J$

Answer: D

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164. If the binding energy of the deuterium is $2.23 MeV$. The mass defect given in a.m.u. is.

A. -0.0024

B. -0.0012

C. 0.0012

D. 0.0024

Answer: D

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165. Which of the following has the mass closest in value to that of the positron (1 a.m.u. $= 931 MeV$)

A. Proton

B. Electron

C. Photon

D. Neutrino

Answer: B

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166. Size of nucleus is of the order of

A. $10^{-10}m$

B. $10^{-15}m$

C. $10^{-12}m$

D. $10^{-19}m$

Answer: B

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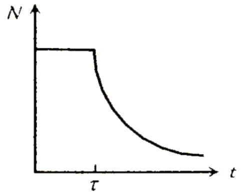
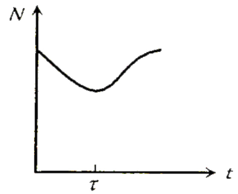
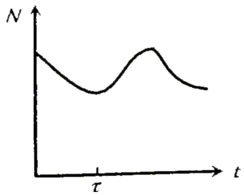
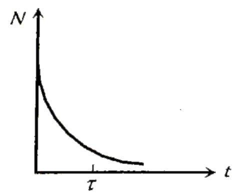
167. A radioactive sample consists of two distinct species having equal number of atoms initially. The mean life of one species is τ and that of the other is 5τ. The decay products in both cases are stable. A plot is made of the total number of radioactive nuclei as a function of time. Which of the following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

(a), (b), (c), (d)

A. 

B. 

C. 

D. 

Answer: D

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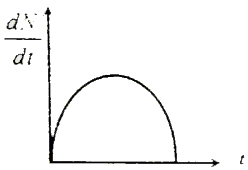
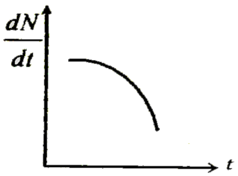
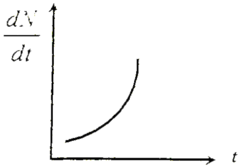
168. Radioactive element decays to form a stable nuclide, then the rate of decay of reactant $\left(\frac{dN}{dt}\right)$ will vary with time (t) as shown in figure.

A. 

B. 

C. 

D. 

Answer: C

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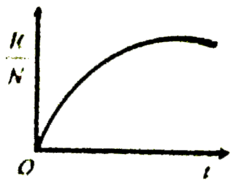
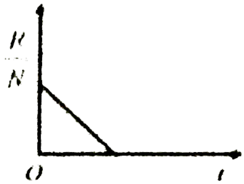
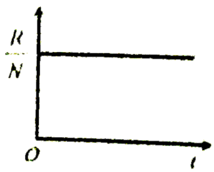
169. A radioactive sample has N_0 active at $t = 0$. If the rate of disintegration at any time is R and the number of atoms is N, them the ratio R/N varies with time as.

A. 

B. 

C. 

D. 

Answer: D

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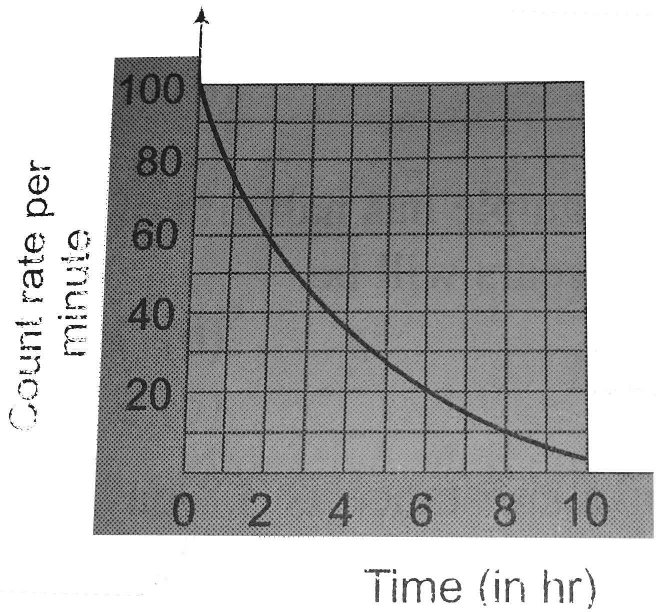
170. The count rate of $10g$ of radioactive material was measured at different times and times has been shown in the figure. The half-life of material and the total counts (approximately) in the first half life period, respectively are.



.

A. $4h, 9000$

B. $3h, 14000$

C. $3h, 235$

D. $3h, 50$

Answer: B

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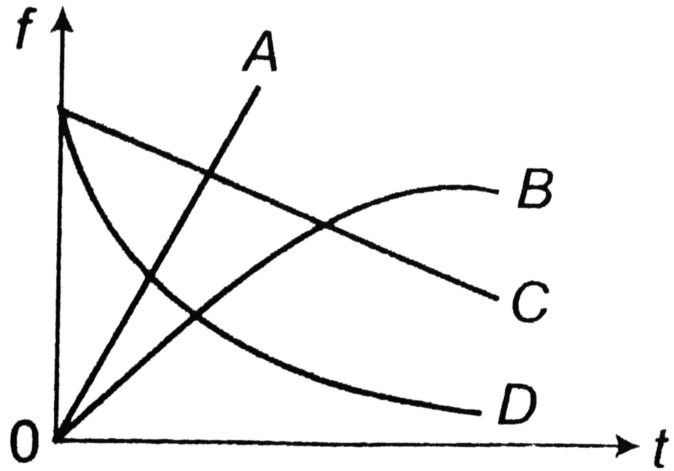
171. The fraction f of radioactive material that has decayed in time t, varies with time t. The correct variation id given by the curve.



A. A

B. B

C. C

D. D

Answer: B

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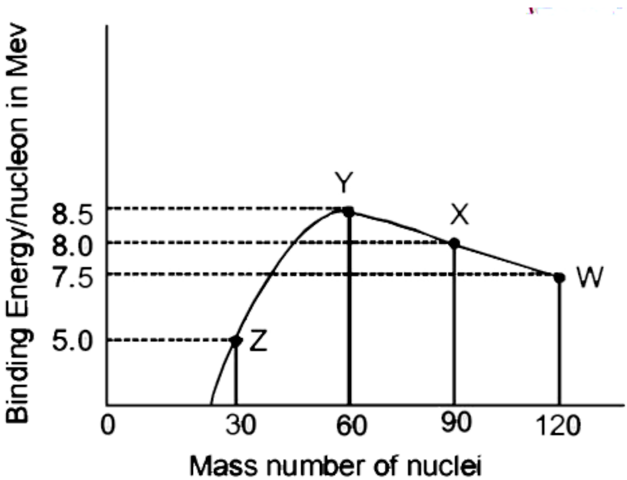
172. Binding energy per nucleons vs mass curve for nucleus is shown in the figure W, X, Y and Z are four nuclei indicated on the curve . The process that would release energy is



A. $Y \rightarrow 2Z$

B. $W \rightarrow X + Z$

C. $W \rightarrow 2Y$

D. $X \rightarrow Y + Z$

Answer: C

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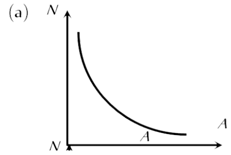
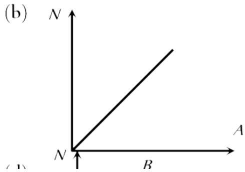
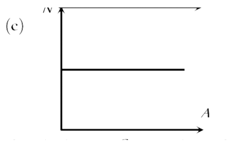
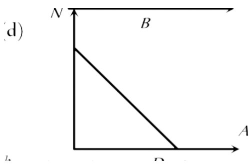
173. The graph between number of decayed atoms N' of a radioactive element and time t is.

A. 

B. 

C. 

D. 

Answer: D

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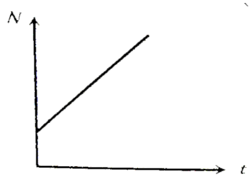
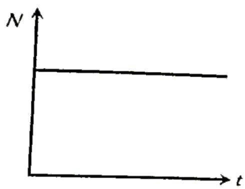
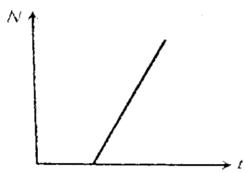
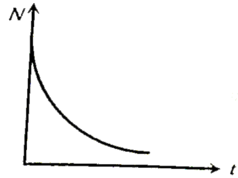
174. The graph between the instantaneous concentration (N) of a radioactive element and time (t) is.

A. 

B. 

C. 

D. 

Answer: D

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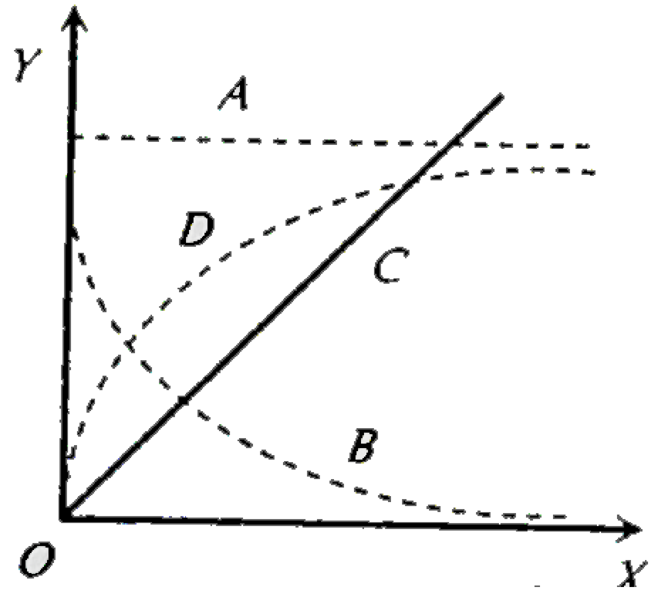
175. In Fig. X represents time and Y represent activity of a radioactive sample. Then the activity of sample, varies with time according to the curve



A. A

B. B

C. C

D. D

Answer: B

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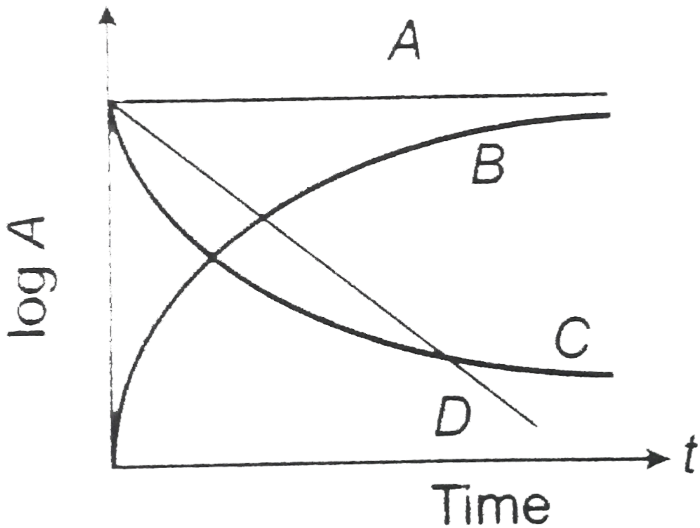
176. The graph which represents the correct variation of logarithm of activity (log A) versus time, in figure is.



.

A. A

B. B

C. C

D. D

Answer: D

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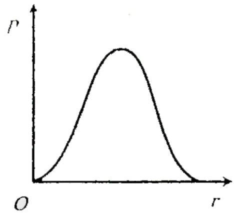
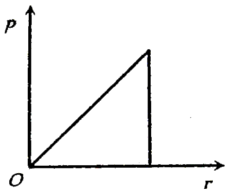
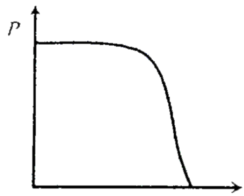
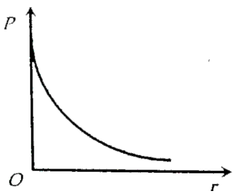
177. The charge density in a nucleus varies with distance from the centre of the nucleus according to the curve in Fig.

A. 

B. 

C. 

D. 

Answer: C

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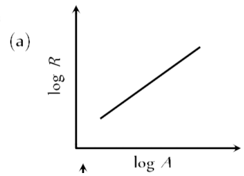
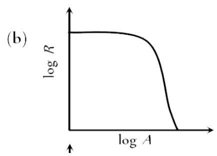
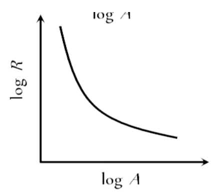
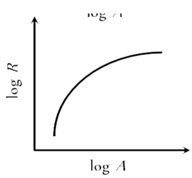
178. The graph between log R and log A wher R is the nuclear radius and A is the mass of is.

A. 

B. 

C. 

D. 

Answer: A

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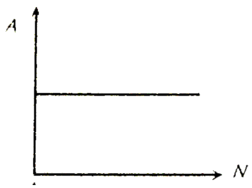
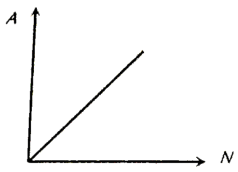
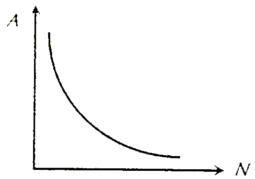
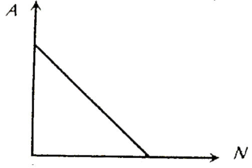
179. The curve between the activity A of a radioactive sample and the number of active atoms N is.

A. 

B. 

C. 

D. 

Answer: B

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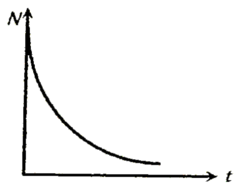
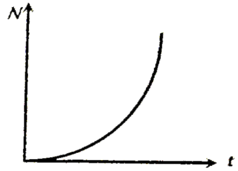
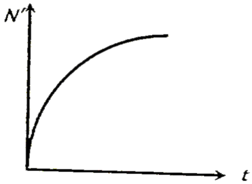
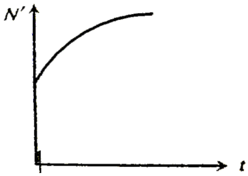
180. The graph between number of decayed atoms N' of a radioactive element and time t is.

A. 

B. 

C. 

D. 

Answer: C

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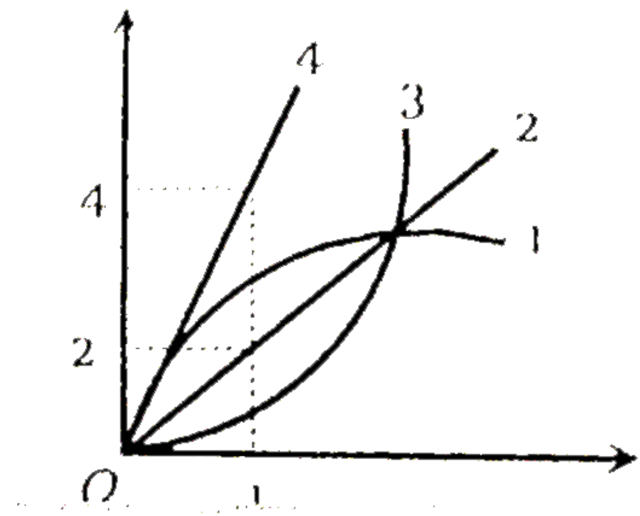
181. The figure shows a graph between $1n\left|\frac{A_n}{A_1}\right|$ and $1n|n|$, where A_n is the area enclosed by the n^{th} orbit in a hydrogen like atom. The correct curve is



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182. It is not possible to use $.^{35}C1$ as the fuel for fusion energy.

The binding energy of $.^{35}C1$ is too small.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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183. $.^{90}Sr$ from the radioactive fall out from nuclear bomb ends up in the bones of human being through the milk consumed by them. It causes impairment of the production of res blood cells.

The energetics $\beta-$ particles emitted in the decay of $.^{90}Sr$ damage the bone marrow.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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184. Assertion: Bohr had to postulate that the electrons in stationary orbits around the nucleus do not radiate.

Reason: According to classical physical all moving electrons radiate.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

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185. Assertion: Radioactive nuclei emit β^{-} particles.

Reason: Electrons exist inside the nucleus.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of

the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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186. Staements I: $._{z}X^{4}$ undergoes 2α-decays, 2β-decays (negative β) and 2γ-decays. As a result, the daughter product is $._{z}._{-2}X^{A-B}$.

Staements II: In α-decay, the mass number decreases by 4 unit and atomic number decreases by 2 unit. In β-decay (negative β), the mass number remains unchanged and atomic number increases by 1 unit. In γ-decay, mass number and atomic number remain unchanged.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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187. Assertion-Density of all the nuclei is same.

Reason-Radius of nucleus is directly proportional to the cube root of mass number.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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188. Assertion : Isobars are the element having same mass number but different atomic number.

Reason : Neutrons and protons are present inside nucleus

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

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189. Assertion: The force of repulsion between atomic nucleus and α-particle varies with distance according to inverse square law.

Reason: Rutherford did α-particles scattering experiment.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

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190. Assertion: The positively changed nucleus of an atom has a radius of almost $10^{-15} m$.

Reason: In α-particle scattering experiment the distance of closest apporach for α-particles is $\approx 10^{-15} m$.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of

the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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191. Assertion: According to classical theory, the proposed path of an electron in Rutherford atom model will be parabolic.

Reason: According to electromagnetic theory an accelerated particel continuosly emits radiation.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false.

D. If assertion is false but reason is true

Answer: D

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192. Assertion: Electrons in the atom are held due to coulomb forces.

Reason: The atom is stable only because the centripetal force due to Coulomb's law is balanced by the centrifugal force.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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193. Assertion: The electron in the hydrogen atom passes from energy level $n=4$ to the $n=1$ level. The maximum and minimum number of photon that can be emitted are six and one respectively.

Reason: The photons are emitted when electron make a transtition from the higher energy state to the lower energy state.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

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194. Assertion: Hydrogen atom consists of anly one electron but its emission spectrum has may lines.

Reason: Only Lyman series is found in the absorption spectrum of hydrogen atom whereas in the emission spectrum, all the series are found.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

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195. Assertion: It is essential that all the lines available in the emission spectrum will also be available in the absorption spectrum.

Reason: The spectrum of hydrogen atom is only absorption spectrum.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of

the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: D

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196. Assertion: For the scattering of α-particles at a large angles, only the nucleus of the atom is responsible.

Reason: Nucleus is very heavy in comparison to electrons.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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197. All the radioactive elements are ultimately converted in lead.

All the elements above lead are unstable.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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198. Amongst α, β and $\gamma -$ particles, $\alpha -$ particle has maximum penetrating power.

The $\alpha -$ particle is heavier than β and $\gamma -$ particle.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: D

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199. The ionising power of $\alpha -$ particle is less compared to $\alpha -$ particles but their penetrating power is more.

The mass of $\beta -$ particle is less than the mass of α-particle.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of

the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

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200. The mass of $\beta-$ particles when they are emitted is higher than the mass of electrons obtained by other means

$\beta-$ particle and electron, both are similar particles.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

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201. Radioactivity of 108 undecayed radioactive nuclei of half life of 50 days is equal to that of 1.2×108 number of undecayed nuclei of some material with half life of 60 days Radioactivity is proportional to half-life.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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202. Assertion (A) : Fragments produced in the fission of U^{235} are radioactive.

Reason (R) : The fragments have abnormally high proton to neutron ratio

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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203. Electron capture occurs more often than positron emission in heavy elements.

Heavy elements exhibit radioactivity.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

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204. The mass of a nucleus can be either less than or more than the sum of the masses of nucleons present in it.

The whole mass of the atom is considered in the nucleus.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false.

D. If assertion is false but reason is true

Answer: D

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

A. $F \propto 1/n^3$

B. $F \propto 1/n^4$

C. $F \propto 1/n^5$

D. Does not depend on n

Answer: B

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206. A nucleus $._Z X^A$ emits $9\alpha -$ particles and $5p$ particle. The ratio of total protons and neutrons in the final nucleus is.

A. $\dfrac{Z-13}{(A-Z-23)}$

B. $\dfrac{(Z-18)}{(A-36)}$

C. $\dfrac{(Z-13)}{(A-36)}$

D. $\dfrac{(Z-13)}{(A-Z-13)}$

Answer: A

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207. $t_{1/2}$ is the half of a substance then $t_{3/4}$ is the time in which substance

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

B. Remains $\frac{3}{4}th$

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

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

Answer: A

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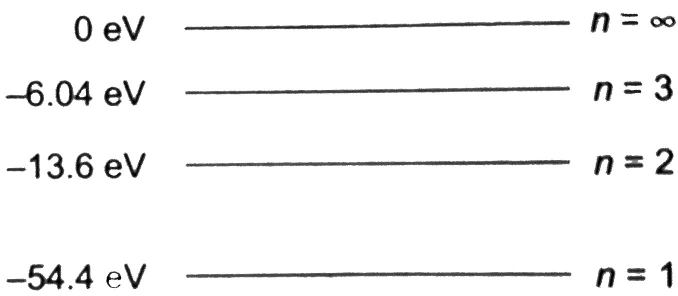
208. The enegry level diagram for an hydrogen-like atom is shown in the figure. The radius of its first Bohr orbit is



A. 0.265Å

B. 0.53Å

C. 0.132Å

D. None of these

Answer: A

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209. How much work must be done to pull apart the electron and the proton that make up the Hydrogen atom, if the atom is initially in the state with $n = 2$?

A. $13.6 \times 1.6 \times 10^{-19} J$

B. $3.4 \times 1.6 \times 10^{-19} J$

C. $1.51 \times 1.6 \times 10^{-19} J$

D. 0

Answer: B

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210. The nuclide $.^{131} I$ is radioactive, with a half-life of 8.04 days. At noon on January 1, the activity of a certain sample is 60089. The activity at noon on January 24 will be

A. 75 Bq

B. Less than 75 Bq

C. More than 75 Bq

D. 150 Bq

Answer: C

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211. U^{238} decays into Th^{234} by the emission of an a-particle. There follows a chain of further radioactive decays, either by α-decay or by

$\beta -$ decay. Eventually a stable nuclide is reached and after that, no further radioactive decay is possible. which of the following stable nuclides is the end product of the U^{238} radioactive decay chain ?

A. Pb^{206}

B. Pb^{207}

C. Pb^{208}

D. Pb^{209}

Answer: A

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

A. Increases, remains the same

B. Decreases, increases

C. Decreases, remains same

D. Increases, decreases

Answer: A

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213. When a sample of solid lithium is placed in a flask of hydrogen gas then following reaction happened $._1^1 H + ._3 Li^7 \rightarrow ._2 He^4 + ._2 He^4$. This statement is.

.

A. 1

B.

C. May be true at a particular pressure

D. None of these

Answer: B

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214. Consider an initially pure $M gm$ sample of X, an isotope that has a half-life of T hour, what is its initial decay rate (N_A = Avogadro No, atomic weight of X is A)

A. $\frac{MN_A}{T}$

B. $\frac{0.693MN_A}{T}$

C. $\frac{0.693MN_A}{AT}$

D. $\frac{2.303 M N_A}{A T}$

Answer: C

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215. At a given instant there are 25% undecayed radioactive nuclei in a same. After $10 \sec$ the number of undecayed nuclei reduces to 6.25%, the mean life of the nuclei is.

A. 14.43 sec

B. 7.21 sec

C. 5 sec

D. 10 sec

Answer: B

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216. Highly energetic electrons are bombarded on a target of an element containing 30 neutrons. The ratio of radii of nucleus to that of Helium nucleus is $141 / 3$. The atomic number of nucleus will be.

A. 25

B. 26

C. 56

D. 30

Answer: B

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217. The ratio of ionization energy of Bohr's hydrogen atom and Bohr's hydrogen-like lithium atom is

A. $1:1$

B. $1:3$

C. $1:9$

D. None of these

Answer: C

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218. What is the angular momentum of an electron in Bohr's hydrogen atom whose energy is $-0.544eV$?

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

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

C. $\frac{5h}{2\pi}$

D. $\frac{7h}{2\pi}$

Answer: C

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219. Consider a hypothetical annihilation of a stationary electron with a stationary positron. What is the wavelength of the resulting radiation?

A. $\frac{h}{2m_0c}$

B. $\frac{h}{m_0c}$

C. $\frac{2h}{m_0c}$

D. $\frac{h}{m_0c^2}$

Answer: B

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

A. 5

B. 10

C. 15

D. None of these

Answer: C

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221. A hydrogen atom emits a photon corresponding to an electron transition from $n = 5$ to $n = 1$. The recoil speed of hydrogen atom is almost (mass of proton $\approx 1.6 \times 10^{-27} kg$).

A. 10 ms

B. $2 \times 10ms$

C. $4ms$

D. $8 \times 10ms$

Answer: C

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222. Number of nuclei of a radioactive substance are 1000 and 900 at times $t = 0$

and time $t = 2s$. Then, number of nuclei at time $t = 4s$ will be

A. 800

B. 810

C. 790

D. 700

Answer: B

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

A. 1

B. 8

C. 4

D. 16

Answer: B

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224. If the series limit of Lyman series for Hydrogen atom is equal to the series limit Balmer series for a hydorgen like atom, then atomic number of this hydrogen-like atom will be

A. 1

B. 2

C. 3

D. 4

Answer: B

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225. Which sample contains greater number of nuclei ?

a $5.00-\mu Ci$ sample of $.^{240}Pu$ (half-life $6560y$)

or $a4.45-\mu Ci$ sample of $.^{243}Am$ (half-life $7370y$).

A. $._{240}Pu$

B. $._{243}Am$

C. Equal in both

D. None of these

Answer: C

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226. The fission of U^{235} can be triggered by the absorption of a slow neutrons by a nucleus. Similarly a slow protons can also be used. This statement is.

A. Correct

B. Wrong

C. Information is insufficient

D. None of these

Answer: B

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227. The radioactivity of a given sample of whisky due to tritium (half life 12.3 years) was found to be only 3% of that measured in a recently purchased bottle marked $''7$ years old". The sample must have been prepared about.

A. 220 years back

B. 300 years back

C. 400 years back

D. 70 years back

Answer: D

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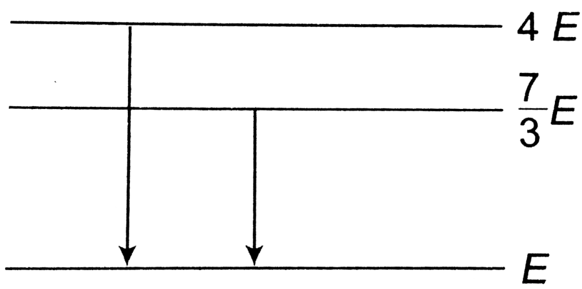
228. The following diagram indicates the energy levels of a certain atom when the system moves from $4E$ level to E. A photon of wavelength λ_1 is emitted. The wavelength of photon produced during its transition from $\frac{7}{3}E$ level to E is λ_2. the ratio $\frac{\lambda_1}{\lambda_2}$ will be



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Ordinary

1. In a hydrogen atom, which of the following electronic transitions would involve the maximum energy change

A. From $n = 2 \text{ to } n = 1$

B. From $n = 3 \text{ to } n = 1$

C. From $n = 4 \text{ to } n = 2$

D. From $n = 3 \text{ to } n = 2$

Answer: B

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2. Which one of these is non-divisibl

A. Nucleus

B. Photon

C. Proton

D. Atom

Answer: B

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3. The concept of stationary orbits was proposed by

A. Neil Bohr

B. J.J. Thomson

C. Ruther ford

D. I. Newton

Answer: A

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4. Who discovered spin quantum number

A. Unlenbeck and Goudsmit

B. Nell’s Bohr

C. Zeeman

D. Sommerfield

Answer: A

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5. The order of the size of nucleus and Bohr radius of an atom respectively are

A. $10^{-14}m, 10^{-10}m$

B. $10^{-10}m, 10^{-8}m$

C. $10^{-20}m, 10^{-16}m$

D. $10^{-8}m, 10^{-6}m$

Answer: A

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6. The ratio of the wavelengths for $2 \rightarrow 1$ transition in Li, He, and H is

A. $1:2:3$

B. $1:4:9$

C. $4:9:36$

D. $3:2:1$

Answer: C

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

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

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

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

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

Answer: A

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8. The possible quantum number for 3 d electron are

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

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

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

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

Answer: B

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9. Which of the following is quantised according to Bohr’s theory of hydrogen atom

A. Linear momentum of electron

B. Angular momentum of electron

C. Linear velocity of electro

D. Angular velocity of electron

Answer: B

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10. The colour of the second line of Balmer series is

A. Blue

B. Yellow

C. Red

D. Violet

Answer: A

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11. The kinetic energy of an electron revolving around a nucleus will be

A. Four times of P.E.

B. Double of P.E.

C. Equal to P.E.

D. Half of its P.E.

Answer: D

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12. In Bohr's model of hydrogen atom, which of the following pairs of quantities are quantized

A. Energy and linear momentum

B. Linear and angular momentum

C. Energy and angular momentum

D. None of the above

Answer: C

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13. Energy of an electron in n th orbit of hydrogen atom is $\left(k = \dfrac{1}{4\pi\varepsilon_0}\right)$

A. $-\dfrac{2\pi^2 k^2 m e^4}{n^2 h^2}$

B. $-\dfrac{4\pi^2 m k e^2}{n^2 h^2}$

C. $-\dfrac{n^2 h^2}{2\pi k m e^4}$

D. $-\dfrac{n^2 h^2}{4\pi^2 k m e^2}$

Answer: A

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14. Which one of the relation is correct between time period and number of orbits while an electron is revolving in a orbit

A. n^2

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

C. n^3

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

Answer: C

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15. Radius of first Bohr orbit is r . What is the radius of 2^{nd} Bohr orbit?

A. $8r$

B. $2r$

C. $4r$

D. $2\sqrt{2r}$

Answer: C

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Nuckeus Nuclear Reaction

1. The neutron was discovered by

A. Marie Curie

B. Pierre Curie

C. James Chadwick

D. Rutherford

Answer: C

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2. Nuclear binding energy is equivalent to

A. Mass of proton

B. Mass of neutron

C. Mass of nucleus

D. Mass defect of nucleus

Answer: D

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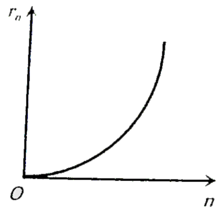
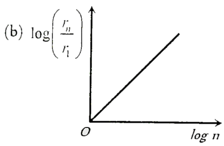
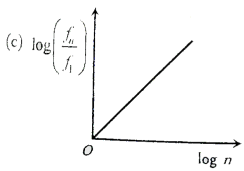
Graphical Questions

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

A. 

B. 

C. 

D. Both (a) and (b)

Answer: D

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Assertion And Reason

1. Assertion : Neutrons penetrate matter more readily as compared to protons.

Reason : Neutrons are slightly more massive than protons

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

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S Et

1. Nuclear reactions are given as

(i) $\square\ (n, p)_{15}p^{32}$

(ii) $\square\ (p, \alpha)_{8}O^{16}$

(iii) $._{7}\ \square^{4}\ (p)._{6}\ C^{14}$

missing particle or nuclide (in box $\square$) in these reactions are respectively

A. $S^{32}, F^{19}, ._{0}\ n^{1}$

B. $F^{19}, S^{32}, \cdot_0 n^1$

C. $Be, F^{19}, \cdot_0 n^1$

D. None of these

Answer: A

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