* SECTION - A [800]

1. Match List I with List II

List I(Quantum Number)	List II(Information provided)
A. mı	I. Shape of orbital
B. m_s	II. Size of orbital
C. 1	III. Orientation of orbital
D. n	IV. Orientation of spin of electron

Choose the correct answer from the options given below :

(A) $A-III, B-IV, C-I, D-II$

(B) $A-III, B-IV, C-II, D-I$

(C) $A-II, B-I, C-IV, D-III$

(D) $A-I, B-III, C-II, D-IV$

2. If radius of second Bohr orbit of the He^{+}ion is $105.8\,pm$, what is the radius of third Bohr orbit of Li^{2+} ion?

(A) $15.87\,pm$ (B) $1.587\,pm$ (C) $158.7\,\mathring{A}$ (D) $158.7\,pm$

3. A particular station of All India Radio, New Delhi, broadcasts on a frequency of $1,368\,\mathrm{kHz}$ $(kilohertz)$. The wavelength of the electromagnetic radiation emitted by the transmitter is : [speed of light $c = 3.0 \times 10^{8}\ \mathrm{ms}^{-1}$]

(A) $219.3\ \mathrm{m}$ (B) $219.2\ \mathrm{m}$ (C) $2192\ \mathrm{m}$ (D) $21.92\ \mathrm{cm}$

4. From the following pairs of ions which one is not an iso-electronic pair?

(A) $\mathrm{O}^{2-}, \mathrm{F}^{-}$

(B) $\mathrm{Na}^{+}, \mathrm{Mg}^{2+}$

(C) $\mathrm{Mn}^{2+}, \mathrm{Fe}^{3+}$

(D) $\mathrm{Fe}^{2+}, \mathrm{Mn}^{2+}$

5. The number of angular nodes and radial nodes in $3s$ orbital are

(A) 0 and 1, respectively

(B) 0 and 2, respectively

(C) 1 and 0, respectively

(D) 3 and 0, respectively

6. The number of protons, neutrons and electrons in ${}^{175}_{71}Lu$, respectively, are :

(A) $175, 104$ and 71 (B) $71, 104$ and 71 (C) $104, 71$ and 71 (D) $71, 71$ and 104

7. Orbital having 3 angular nodes and 3 total nodes is

(A) $5p$ (B) $3d$

(C) $4f$ (D) $6d$

8. $4d, 5\mathrm{p}, 5\mathrm{f}$ and $6\mathrm{p}$ orbitals are arranged in the order of decreasing energy. The correct option is

(A) $5f > 6p > 5p > 4d$ (B) $6p > 5f > 5p > 4d$

(C) $6p > 5f > 4d > 5p$ (D) $5f > 6p > 4d > 5p$

9. Which of the following series of transitions in the spectrum of hydrogen atom falls in visible region ?

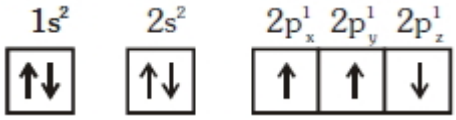
(A) Lyman series (B) Balmer series (C) Paschen series (D) Brackett series

10. Which one is a wrong statement ?

(A) Total orbital angular momentum of electron in 's' orbital is equal to zero

(B) An orbital is designated by three quantum numbers while an electron in an atom is designated by four quantum numbers

(C) The electronic configuration of N atom is



(D) The value of m for d_z^2 is zero

11. The total number of orbitals present for principle quantum number, $n = 4$ is

(A) 12 (B) 15 (C) 16 (D) 30

12. How many electrons can fit in the orbital for which $n = 3$ and $l = 1$?

(A) 6 (B) 2

(C) 10 (D) 14

13. Which of the following pairs of $d-$ orbitals will have electron density along the axes ?

(A) d_{z^2}, d_{xz} (B) d_{xz}, d_{yz} (C) $d_{z^2}, d_{x^2-y^2}$ (D) $d_{xy}, d_{x^2-y^2}$

14. Calculate the energy in joule corresponding to light of wavelength $45\,nm$. (Planck's constant, $h = 6.63 \times 10^{-34}\ J\ s$, speed of light, $c = 3 \times 10^8\ m\ s^{-1}$)

(A) 6.67×10^{15} (B) 6.67×10^{11}

(C) 4.42×10^{-15} (D) 4.42×10^{-18}

15. Be^{2+} is isoelectronic with which of the following ions?

(A) H^+ (B) Li^+ (C) Na^+ (D) Mg^{2+}

16. According to law of photochemical equivalence the energy absorbed (in ergs/mole) is given as
$(h = 6.62 \times 10^{-27}\ ergs,\ c = 3 \times cms^{-1},\ N_A = 6.02 \times 10^{-23}\ mol^{-1})$

(A) $\frac{1.196 \times 10^8}{\lambda}$ (B) $\frac{2.859 \times 10^5}{\lambda}$

(C) $\frac{2.859 \times 10^{16}}{\lambda}$ (D) $\frac{1.196 \times 10^{16}}{\lambda}$

17. The outer electronic configuration of $Gd\ (At.\ No.\ 64)$ is

(A) $4f^5\ 5d^4\ 6s^1$ (B) $4f^7\ 5d^1\ 6s^2$ (C) $4f^3\ 5d^5\ 6s^2$ (D) $4f^4\ 5d^5\ 6s^1$

18. Based on equation $E = -2.178 \times 10^{-18}\ J\ \left(\frac{Z^2}{n^2}\right)$ certain conclusions are written. Which of themis not correct?

(A) Equation can be used to calculate the change in energy when the electron changes orbit.

(B) For $n = 1$, the electron has a more negative energy than it does for $n = 6$ which means that the electron is more loosely bound in the smallest allowed orbit.

(C) The negative sign in equation simply means that the energy of electron bound to the nucleus is lower than it would be if the electrons were at the infinite distance from the nucleus.

(D) Larger the value of n, the larger is the orbit radius.

19. An atom has 35 nucleons and has atomic number equal to 17 . The number of electrons with $n = 2$, $m = 0$ in it is

(A) 2 (B) 4 (C) 6 (D) 3

20. If there is 2 nodal surfaces in third excited state. Find the orbital angular momentum

(A) $\sqrt{3}\,\hbar$ (B) $\sqrt{2}\,\hbar$ (C) $4\,\hbar$ (D) $\frac{1}{\sqrt{2}\,\hbar}$

21. Match the columns and choose correct option

Column $-I$	Column $-II$
$(a)\ 4s$	(p) Circular orbit around nucleus
$(b)\ 4p$	(q) Non directional orbital
$(c)\ 1s$	(r) Angular momentum $= 2h/\pi$
$(d)\ 3d$	(s) Radial node is zero

(A) $a-p, b-q, c-r, d-s$ (B) $a-q, b-r, c-p, d-s$

(C) $a-s, b-r, c-q, d-p$ (D) $a-p, b-r, c-s, d-q$

22. In H atom, an orbit has diameter of about $16.92\,\overset{o}{A}$. What is the maximum number of electrons that can be accommodated?

(A) 16 (B) 32

(C) 64 (D) 8

23. If the aufbau principle had not been foll owed. $Ca(Z=20)$ would have been placed in the

(A) $s-block$ (B) $p-block$ (C) $d-block$ (D) $f-block$

24. In Niobium $(Z=41)$ the number of electrons with $m=-1$ will be

(A) 7 or 8 (B) 8 or 9 (C) 1 or 2 (D) 3 or 4

25. If the n^{th} specific period of periodic table contain $\frac{(n+2)^2}{2}$ elements then maximum value of azimuthal quantum number associated with that period is

(A) $\frac{(n-1)}{2}$

(B) $\frac{n}{2}$

(C) $\frac{n+1}{2}$

(D) $\frac{n+2}{2}$

26. For $3d_{z^2}$ calculate the value of n, ℓ, m and s

(A) $n \to 5, l \to 2, m \to -1, s \to +\frac{1}{2} or -\frac{1}{2}$

(B) $n \to 3, l \to 2, m \to 0, s \to +\frac{1}{2} or -\frac{1}{2}$

(C) $n \to 3, l \to 1, m \to +1, s \to +\frac{1}{2} or -\frac{1}{2}$

(D) None of these

27. The orbital angular momentum of $3p$ electron is

(A) $\sqrt{3}h$

(B) $\sqrt{6}h$

(C) zero

(D) $\sqrt{3}\frac{h}{2\pi}$

28. If the sum of $(n+l)$ is 6 ; how many $e^{-1}\,s$ would have clock wise spin associated with this energy leval

(A) 18 (B) 9 (C) 6 (D) 32

29. Arrange in decreasing order, the energy of $2s-$ orbital in following atoms H, Li, Na, K

(A) $E_{2s(H)} < E_{2s(Li)} < E_{2s(Na)} < E_{2s(K)}$

(B) $E_{2s(H)} = E_{2s(Li)} = E_{2s(Na)} = E_{2s(K)}$

(C) $E_{2s(H)} > E_{2s(Li)} > E_{2s(Na)} > E_{2s(K)}$

(D) $E_{2s(H)} > E_{2s(Li)} > E_{2s(Na)} = E_{2s(K)}$

30. Which statement is not true, regarding $2\,s$ orbital.

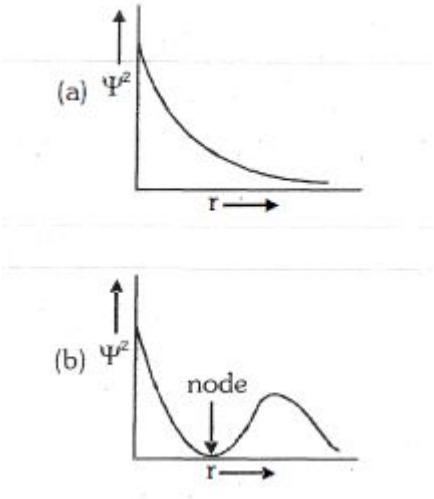
(A) Number of radial nodes is greater than zero

(B) Angular nodes is equal to zero

(C) $\Psi(\theta,\phi) =$ constant

(D) Probability density is zero at nucleus

31. In following two plots, ψ^2 is plotted against the distance $'r'$ from nucleus select the correct statement



(A) $'a'$ is for $1s$ and $'b'$ for $2s$

(B) $'a'$ is for $2s$ and $'b'$ for $1s$

(C) $'a'$ is for $2s$ and $'b'$ for $2P$

(D) $'a'$ is for $2p$ and $'b'$ for $2s$

32. Choose the correct altenatives. The number of unpaired electrons in an atom of

(A) $_{14}Si$ is 2 (B) $_{14}Si$ is 0

(C) $_{15}P$ is 3 (D) $_{15}P$ is 1

33. The electronic configurations of Cr^{24} and Cu^{29} are abnormal

(A) Due to extra stability of exactly half filled and exactly fully filled sub shells

(B) Because they belong to $d-$ block

(C) Both the above

(D) None of the above

34. The electrons, identified by quantum by numbers n and l, $(i)\, n=4, l=1$ $(ii)\, n=4, l=0$ $(iii)\, n=3, l=2$ $(iv)\, n=3, l=1$ can be placed in order of increasing energy, from the lowest to highest, as

(A) $(iv)<(ii)<(iii)<(i)$ (B) $(ii)<(iv)<(i)<(iii)$

(C) $(i)<(iii)<(ii)<(iv)$ (D) $(iii)<(i)<(iv)<(ii)$

35. The set of quantum number for the 19^{th} electrons in chromium is

(A) $n=4, l=0, s=+1/2$ or $-1/2$

(B) $n=3, l=2, m=1, s=+1/2$ or $-1/2$

(C) $n=3, l=2, m=-1, s=+1/2$ or $-1/2$

(D) $n=4, l=1, m=0, s=+1/2$ or $-1/2$

36. The quantum numbers $+1/2$ and $-1/2$ for the electron spin represent

(A) rotation of the electron in clockwise and anticlockwise derection respectively

(B) rotation of the electron in anticlockwise and clockwise direction respectively

(C) magnetic moment of the electron pointing up and down respectively

(D) two quantum mechanical spin states which have no classical analogue

37. The spin of the electron

(A) increases the angular momentum

(B) can be backward (anti-clockwise) relative to the direction of the path of the electron

(C) can be forward (clockwise) relative to the direction of the path of the electron.

(D) Both (b) and (c)

38. Quantum No. $l=2$ and $m=0$ represent which orbital :

(A) d_{xy} (B) $d_x^2-y^2$ (C) d_z^2 (D) d_{zx}

39. The maximum number of electrons in subshell is given by the expression :

(A) $4l+2$ (B) $4l-2$ (C) $2l+1$ (D) $2n^2$

40. The atomic orbital is:

(A) the circular path of the electron

(B) elliptical shaped orbit

(C) three-dimensional field around nucleus

(D) the region in which there is maximum probability of finding an electron

41. For a d electron, the orbital angular momentum is

(A) $\sqrt{6\hbar}$ (B) $\sqrt{2\hbar}$ (C) $\hbar$ (D) $2\hbar$

42. The orbital angular momentum of an electron in an s orbital is

(A) 1 (B) 0 (C) $\frac{\sqrt{2h}}{2\prod}$ (D) all of these

43. What is the value of azimuthal quantum number for 'g' sub shell ?

(A) 3 (B) 4 (C) 6 (D) 5

44. For an electron, with $n=3$ has only one radial node. The orbital angular momentum of the electron will be

(A) 0 (B) $\sqrt{6}\frac{h}{2\pi}$ (C) $\sqrt{2}\frac{h}{2\pi}$ (D) $3(\frac{h}{2\pi})$

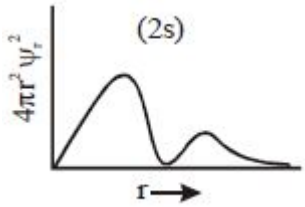
45. For an electron, with $n=3$ has only one radial node. The orbital angular momentum of the electron will be

(A) 0 (B) $\sqrt{6}\frac{h}{2\pi}$

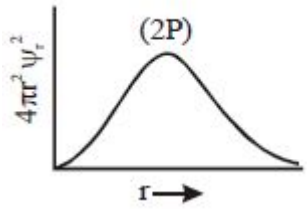
(C) $\sqrt{2}\frac{h}{2\pi}$ (D) $3\left(\frac{h}{2\pi}\right)$

46. Which of the following plots of radial probability function $4\pi r^2\Psi_r^2$ is incorrectly labelled

(A)



(B)



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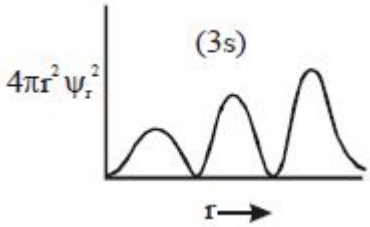
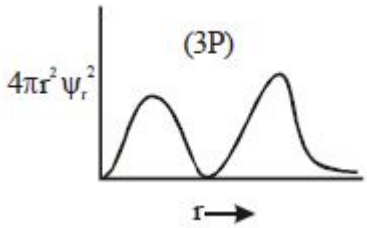


(D)



47. Pauli's exclusion principle states that

(A) Nucleus of an atom contains no negative charge

(B) Electrons move in circular orbits around the nucleus

(C) Electrons occupy orbitals of lowest energy

(D) All the four quantum numbers of two electrons in an atom cannot be equal

48. A filled or half-filled set of p or d-orbitals is spherically symmetric. Point out the species which has spherical symmetry

(A) Na (B) C (C) Cl^- (D) Fe

49. For sodium atom the number of electrons with $m = 0$ will be

(A) 2 (B) 7 (C) 9 (D) 8

50. The maximum number of electrons that can be accommodated in $'f'$ sub shell is

(A) 2 (B) 8 (C) 32 (D) 14

51. Number of orbitats in h sub-shell is

(A) 11 (B) 15 (C) 17 (D) 19

52. What is the maximum number of electrons which can be accommodated in an atom in which the highest principal quantum number value is 4

(A) 10 (B) 18 (C) 32 (D) 54

53. In a potassium atom, electronic energy levels are in the following order

(A) $4s > 3d$ (B) $4s > 4p$ (C) $4s < 3d$ (D) $4s < 3p$

54. Which electronic configuration is not observing the $(n+l)$ rule

(A) $1s^2$, $2s^2 2p^6$, $3s^2 3p^6 3d^1$, $4s^2$

(B) $1s^2$, $2s^2 sp^6$, $3s^2 3p^6 3d^7$, $4s^2$

(C) $1s^2$, $2s^2 2p^6$, $3s^2 3p^6 3d^5$, $4s^1$

(D) $1s^2$, $2s^2 2p^6$, $3s^2 3p^6 3d^8$, $4s^2$

55. The maximum number of electrons that can be accommodated in the M^{th} shell is

(A) 2 (B) 8 (C) 18 (D) 32

56. The maximum energy is present in any electron at

(A) Nucleus

(B) Ground state

(C) First excited state

(D) Infinite distance from the nucleus

57. The four quantum number for the valence shell electron or last electron of sodium $(Z = 11\ )$ is

(A) $n = 2, l = 1, m = -1, s = -\frac{1}{2}$

(B) $n = 3, l = 0, m = 0, s = +\frac{1}{2}$

(C) $n = 3, l = 2, m = -2, s = -\frac{1}{2}$

(D) $n = 3, l = 2, m = 2, s = +\frac{1}{2}$

58. Which set of quantum numbers are not possible from the following

(A) $n = 3, l = 2, m = 0, s = -\frac{1}{2}$

(B) $n = 3, l = 2, m = -2, s = -\frac{1}{2}$

(C) $n = 3, l = 3, m = -3, s = -\frac{1}{2}$

(D) $n = 3, l = 0, m = 0, s = -\frac{1}{2}$

59. The number of orbitals in the fourth principal quantum number will be

(A) 4 (B) 8 (C) 12 (D) 16

60. Chromium has the electronic configuration $4s^1 3d^5$ rather than $4s^2 3d^4$ because

(A) $4s$ and $3d$ have the same energy

(B) $4s$ has a higher energy than $3d$

(C) $4s^1$ is more stable than $4s^2$

(D) $4s^1 3d^5$ half-filled is more stable than $4s^2 3d^4$

61. Electronic configuration of H^- is

(A) $1s^0$ (B) $1s^1$ (C) $1s^2$ (D) $1s^1\ 2s^1$

62. The electronic configuration of silver atom in ground state is

(A) $[Kr]3d^{10}\,4s^1$ (B) $[Xe]\,4f^{14}\,5d^{10}\,6s^1$ (C) $[Kr]\,4d^{10}\,5s^1$ (D) $[Kr]\,4d^9\,5s^2$

63. Orbital is

(A) Circular path around the nucleus in which the electron revolves

(B) Space around the nucleus where the probability of finding the electron is maximum

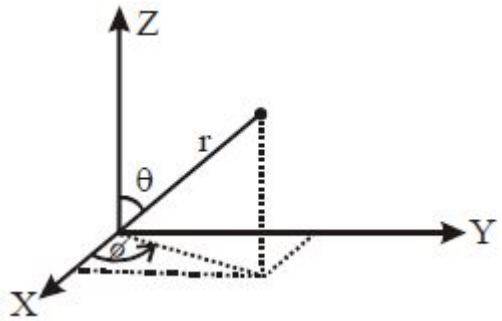
(C) Amplitude of electrons wave

(D) None of these

64. Which quantum number is not related with Schrodinger equation

(A) Principal (B) Azimuthal (C) Magnetic (D) Spin

65. Angular wave function $A(\theta,\phi)$ for any atomic orbital is " $\frac{1}{2}\sqrt{\frac{3}{\pi}\cos\theta}$ " in polar co-ordinate system



(A) $2s$ (B) $2P_x$ (C) $2P_y$ (D) $2P_Z$

66. Angular part of wave function for an orbital is = $\left(\frac{15}{4\pi}\right)^{\frac{1}{2}}\ \sin\theta\,\cos\theta\,\sin\phi$ where θ = angle from $z-$ axis Angular node (s) are

(A) XY plane only (B) YZ plane only

(C) XY & XZ plane only (D) XY , YZ & ZX plane

67. The uncertainty in the position of a moving bullet of mass $10\ gm$ is $10^{-5}\,m$. Calculate the uncertainty in its velocity

(A) $5.2\times10^{-28}\,m/sec$ (B) $3.0\times10^{-28}\,m/sec$ (C) $5.2\times10^{-22}\,m/sec$ (D) $3\times10^{-22}\,m/sec$

68. Simultaneous determination of exact position and momentum of an electron is

(A) Possible

(B) Impossible

(C) Sometimes possible sometimes impossible

(D) None of the above

69. The two particles A and B have de Broglie wavelengths $1\,nm$ and $5\,nm$ respectively. If mass of A is four times the mass of B, the ratio of kinetic energies of A and B would be

(A) $5:1$ (B) $25:4$ (C) $20:1$ (D) $5:4$

70. Number of waves produced by an electron in one complete revolution in n^{th} orbit is

(A) n (B) n^2 (C) $(n+1)$ (D) $(2n+1)$

71. The momentum (in $kg-m/s$) of photon having $6\ MeV$ energy is

(A) 3.2×10^{-21} (B) 2.0 (C) 1.6×10^{-21} (D) 3.2×10^{-18}

72. The radius of second Bohr orbit is x. The de-Broglie wavelength of electron in 4^{th} orbit is nearly

(A) $2\pi x$ (B) $6\pi x$ (C) $9x$ (D) $x/3$

73. Calculate the λ of CO_2 molecule moving with a velocity $440\,m/s$.

(A) $\lambda=1.03\times10^{-11}$ (B) $\lambda=2.06\times10^{-10}$ (C) $\lambda=4.12\times10^{-11}$ (D) $\lambda=2.06\times10^{-11}$

74. The $K.E.$ of an electron is $4.55\times10^{-25}\,J$ Calculate its λ.

(A) $1.944\times10^{-7}\,m$ (B) $19.44\times10^{-7}\,m$ (C) $97.2\times10^{-8}\,m$ (D) $97.2\times10^{-7}\,m$

75. How fast is an electron moving if it has a wavelength equal to the distance it travels in one second ?

(A) $\sqrt{\frac{h}{m}}$ (B) $\sqrt{\frac{m}{h}}$ (C) $\sqrt{\frac{h}{p}}$ (D) $\sqrt{\frac{h}{2(KE)}}$

76. The ratio of the energy of the electrons in ground state of hydrogen to the electrons in first excited state of Be^{3+} is :

(A) $1:4$ (B) $1:8$ (C) $1:16$ (D) $16:1$

77. If a_0 be the Bohr radius, then de-Broglie's wavelength of an electron revolving in the second excited state of $H-$ atom will be

(A) $6\pi a_0$ (B) $4\pi a_0$ (C) $2\pi a_0$ (D) πa_0

78. If electron, hydrogen, helium and neon nuclei are all moving with the velocity of light, then the wavelengths associated with these particles are in the order

(A) Electron > hydrogen > helium > neon

(B) Electron > helium > hydrogen > neon

(C) Electron < hydrogen < helium < neon

(D) Neon < hydrogen < helium < electron

79. A cricket ball of $0.5\,kg$ is moving with a velocity of $100\,m/\sec$. The wavelength associated with its motion is

(A) $1/100\,cm$ (B) $6.6\times10^{-34}\,m$ (C) $1.32\times10^{-35}\,m$ (D) $6.6\times10^{-28}\,m$

80. A $200\,g$ golf ball is moving with a speed of $5\ m$ per hour. The associated wave length is $(h=6.625\times10^{-34}\,J-sec)$

(A) $10^{-10}\,m$ (B) $10^{-20}\,m$ (C) $10^{-30}\,m$ (D) $10^{-40}\,m$

81. If 'X' is ionization energy of hydrogen then the energy required for excitation of Li^{2+} electron from 2^{nd} excited state to 5^{th} excited state is

(A) $\frac{3X}{4}$ (B) $\frac{4}{3X}$ (C) $\frac{X}{12}$ (D) $\frac{12}{X}$

82. Wave number of a spectral line for a given transition is $y\,cm^{-1}$ for He^{+}, then its value for Li^{2+} for the same transition is

(A) $4y\,cm^{-1}$ (B) $y\,cm^{-1}$ (C) $\frac{3y}{4}\,cm^{-1}$ (D) $\frac{9y}{4}\,cm^{-1}$

83. The energy of an electron in the 3^{rd} orbit of a hydrogenic atom is $-E$. The energy of an electron in the first orbit will be

(A) $-3E$ (B) $-E/3$ (C) $-E/9$ (D) $-9E$

84. The wavelngth of radiation emitted when electron falls from 4^{th} Bohr orbit to 2^{nd} in H atom is ..... nm

(A) 972 (B) 486 (C) 243 (D) 182

85. An electron in an atom jumps in such a way that its kinetic energy changes from x to $\frac{x}{4}$. The change in potential energy will be

(A) $+\frac{3}{2}x$ (B) $-\frac{3}{8}x$ (C) $+\frac{3}{4}x$ (D) $-\frac{3}{4}x$

86. Which of the following is correct for Humphrey lines of hydrogen spectrum?

(A) $n_2=7\to n_1=2$

(B) $n_2=10\to n_1=6$

(C) $n_2=5\to n_1=1$

(D) $n_2=11\to n_1=3$

87. What is the shortest wavelength for Paschen series of Li^{2+} ion

(A) $\frac{R}{9}$ (B) $\frac{9}{R}$ (C) $\frac{1}{R}$ (D) $\frac{9R}{4}$

88. If in Bohr's model, for unielectronic atom, time period of revolution is represented as $T_{n,Z}$ where n represents shell no. and Z represents atomic number then the value of $T_{1,2}:T_{2,1}$ will be

(A) $8:1$ (B) $1:8$ (C) $1:1$ (D) $1:32$

89. Which is correct for any $H-$ like species

(A) $(E_2 - E_1) > (E_3 - E_2) > (E_4 - E_3)$

(B) $(E_2 - E_1) < (E_3 - E_2) < (E_4 - E_3)$

(C) $(E_2 - E_1) = (E_3 - E_2) = (E_4 - E_3)$

(D) $(E_2 - E_1) = \frac{1}{4}(E_3 - E_2) = \frac{1}{9}(E_4 - E_3)$

90. Ratio of velocities of e^{Θ} of hydrogen atom in 1^{st} , 2^{nd} , 3^{rd} orbit is

(A) $1:2:3$ (B) $1:1:1$ (C) $1:1/2:1/3$ (D) $3:2:1$

91. If ratio of Area of two orbits of H atom is $4:1$ then the ratio of frequency of e^- in these two orbits is

(A) $\frac{8}{1}$ (B) $\frac{2\sqrt{2}}{1}$ (C) $\frac{1}{2\sqrt{2}}$ (D) $\frac{1}{8}$

92. The shortest wavelength of He^+ ion in Balmer series is x, then longest wavelength in the paschen series of Li^{2+} is

(A) $\frac{36x}{5}$ (B) $\frac{16x}{7}$ (C) $\frac{9x}{5}$ (D) $\frac{5x}{9}$

93. The angular momentum of an electron in a given orbit is J its kinetic energy will be

(A) $\frac{1}{2}\frac{J^2}{mr^2}$ (B) $\frac{JV}{r}$ (C) $\frac{J^2}{2m}$ (D) $\frac{J^2}{2\pi}$

94. The frequency of first line of paschen series in spectrum of Be^{+3} ion is

(A) $\frac{7RC}{9}$ (B) $\frac{7RC}{144}$ (C) $\frac{9RC}{25}$ (D) $\frac{20RC}{9}$

95. The potential energy of electron in third excited state of He^+ ion is ..... eV

(A) -12.08 (B) -3.4 (C) -6.8 (D) -1.7

96. The total energy of the electron of $H-$ atom in the second quantum state is $-E_2$. The total energy of the He^+ atom in the third quantum state is

(A) $-\frac{3}{2}E_2$ (B) $-\frac{2}{3}E_2$ (C) $-\frac{16}{9}E_2$ (D) $-\frac{4}{9}E_2$

97. What is the ratio of time periods (T_1/T_2) in second orbit of hydrogen atom to third orbit of He^+ ion?

(A) $8/27$ (B) $32/27$ (C) $27/32$ (D) $16/18$

98. Find the value of wave number of $(\bar{v})$ in terms of Rydberg's constant, when transition of electron takes place between two levels of He^+ ion whose sum is 4 and difference is 2.

(A) $\frac{8R}{9}$ (B) $\frac{32R}{9}$ (C) $\frac{3R}{4}$ (D) None of these

99. What is the maximum wavelength line in the Lyman series of He^+ ion ?

(A) $3R$ (B) $1/3R$ (C) $4/4R$ (D) None of these

100. The ratio of difference between 1^{st} and 2^{nd} Bohr orbits energy to that between 2^{nd} and 3^{rd} orbits energy is

(A) 0.5 (B) $\frac{1}{3}$ (C) 5.4 (D) $\frac{5}{27}$

101. If shortest wavelength of He^{+} ion in Balmer series is $X\,metres$ then longest wavelength in Paschen series of Li^{+2} ion is

(A) $\frac{36}{5}\,X$ (B) $\frac{16}{7}\,X$ (C) $\frac{9}{5}\,X$ (D) $\frac{5}{9}\,X$

102. A photon of $300\,nm$ is absorbed by a gas and then re-emits two photons. One re-emitted photon has wavelength $496\,nm$, the wavelength of second re-emitted photon is

(A) 759 (B) 857 (C) 957 (D) 657

103. The ratio of the radius of the first three Bohr orbits is

(A) $1:\frac{1}{2}:\frac{1}{3}$ (B) $1:2:3$ (C) $1:4:9$ (D) $1:8:27$

104. In the transition of electron in an atom, its kinetic energy changes from y to $y/4$. The change in $P.E$ will be :-

(A) $\frac{-3}{4}y$ (B) $\frac{3}{4}y$ (C) $\frac{-3}{8}y$ (D) $\frac{3}{2}y$

105. If the shortest wavelength of $H-$ atom in Lyman series is x , then longest wavelength in Balmer series of He^{+} is

(A) $\frac{9x}{5}$ (B) $\frac{36x}{5}$ (C) $\frac{x}{4}$ (D) $\frac{5x}{9}$

106. When electron jumps from $n=5$ to $n=2$ with all possible transitions then correct answer is

(A) Number of lines in ultraviolet region is equal to 3

(B) Number of lines in visible region is equal to 2

(C) Number of lines in infrared region is equal to 3

(D) All of these

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

(A) Energy of a state is doubled

(B) Radius of an orbit is doubled

(C) Velocity of electron in an orbit is doubled

(D) Energy of a state is halved

108. The ratio of two of the first four Bohr's orbits of the hydrogen atom are in the ratio $1:4$ The energy difference between them may be

(A) Either $12.09\,eV$ or $10.2\,eV$ (B) Either $2.55\,eV$ or $10.2\,eV$ (C) Either $13.6\,eV$ or $3.4\,eV$ (D) Either $3.4\,eV$ or $0.85\,eV$

109. The masses of photons corresponding to the first lines of Lyman and Balmer series of the spectrum of hydrogen atom are in the ratio of

(A) $27:5$ (B) $3:2$ (C) $2:3$ (D) $4:9$

110. The wave number of the first Lyman transition in H atom spectrum is equal to the wave number of second balmer transition in the spectrum of

(A) Li^{2+} (B) Be^{3+} (C) He^{+} (D) B^{4+}

111. Total number of spectral lines when electron jumps from 8^{th} orbit to 2^{nd} orbit :

(A) 6 (B) 36 (C) 21 (D) 38

112. The ionization potential of sodium is $5.48\,eV$. The $I.P.$ of potassium is ..... eV

(A) Equal to that of sodium (B) 5.68 (C) 4.68 (D) 10.88

113. In Bohr's model of atom when an electron jumps from $n=1$ to $n=3$, how much energy will be absorbed

(A) $2.15\times10^{-10}\,ergs$ (B) $0.1911\times10^{-10}\,ergs$

(C) $2.389\times10^{-10}\,ergs$ (D) $0.239\times10^{-10}\,ergs$

114. In an atom two electrons move around the nucleus in circular orbits of radii R & $4R$. The ratio of the time taken by them to complete one revolution is :

(A) $1:4$ (B) $4:1$ (C) $1:8$ (D) $8:7$

115. Supposing the energy (in arbitrary units) of the energy levels in the hydrogen atom is given as under:

Energy level	K	L	M	N
	$n=1$	$n=2$	$n=3$	$n=4.....n=\infty$
Energy	$-864\,a.u.$			Zero

the excitation energy needed to raise the electron from M level to $n=\infty$ would be :

(A) 192 (B) 96 (C) 188 (D) 384

116. If the ionization potential of Li^{+2} is $122.4\,eV$. What is the 5^{th} $I.P.$ of carbon V

(A) 979.2 (B) 97.92 (C) 48.96 (D) 489.6

117. Radius of the nucleus is equal to $10^{-12}\,cm.$ and that of the atom is equal to $10^{-8}\,cm.$ What is the fraction of the volume of the atom occupied by nucleus ?

(A) 10^{12} (B) 10^{-12} (C) 10^{-20} (D) 10^{-4}

118. The wave no. of the first line of Balmer series of H atom is $15200\,cm^{-1}$. What is wave number of the first line of Lyman series of Li^{2+} ..... cm^{-1}

(A) 456200 (B) 136800 (C) 738720 (D) 152000

119. In Bohr's model, atomic radius of the first orbit is γ, the radius of the 3^{rd} orbit, is

(A) $\gamma/3$ (B) γ (C) 3γ (D) 9γ

120. Time taken for an electron to complete one revolution in the Bohr orbit of hydrogen atom is

(A) $\frac{4\pi^2 mr^2}{nh}$ (B) $\frac{nh}{4\pi^2 mr}$ (C) $\frac{nh}{4\pi^2 mr^2}$ (D) $\frac{h}{2\pi mr}$

121. The ratio of area covered by second orbital to the first orbital is

(A) $1:2$ (B) $1:16$ (C) $8:1$ (D) $16:1$

122. Energy of electron of hydrogen atom in second Bohr orbit is

(A) $-5.44\times10^{-19}J$ (B) $-5.44\times10^{-19}\,kJ$ (C) $-5.44\times10^{-19}\,cal$ (D) $-5.44\times10^{-19}\,eV$

123. If electron falls from $n=3$ to $n=2$, then emitted energy is ..... eV

(A) 10.2 (B) 12.09 (C) 1.9 (D) 0.65

124. The energy of an electron revolving in n^{th} Bohr's orbit of an atom is given by the expression

(A) $E_n=-\frac{2\pi^2m^4e^2z^2}{n^2h^2}$ (B) $E_n=-\frac{2\pi^2me^2z^2}{n^2h^2}$ (C) $E_n=-\frac{2\pi^2me^4z^2}{n^2h^2}$ (D) $E_n=-\frac{2\pi m^2e^2z^4}{n^2h^2}$

125. The expression for Bohr's radius of an atom is

(A) $r=\frac{n^2h^2}{4\pi^2me^4z^2}$ (B) $r=\frac{n^2h^2}{4\pi^2me^2z}$ (C) $r=\frac{n^2h^2}{4\pi^2me^2z^2}$ (D) $r=\frac{n^2h^2}{4\pi^2m^2e^2z^2}$

126. The energy of an electron in n^{th} orbit of hydrogen atom is

(A) $\frac{13.6}{n^4}\,eV$ (B) $\frac{13.6}{n^3}\,eV$ (C) $\frac{13.6}{n^2}\,eV$ (D) $\frac{13.6}{n}\,eV$

127. The energies E_1 and E_2 of two radiations are $25\,eV$ and $50\,eV$ respectively. The relation between their wavelengths i.e., λ_1 and $\lambda_2$will be

(A) $\lambda_1=\lambda_2$ (B) $\lambda_1=2\lambda_2$ (C) $\lambda_1=4\lambda_2$ (D) $\lambda_1=1/2\lambda_2$

128. Two radiations having energies E_1 and E_2 as $15\,eV$ and $45\,eV$ respectively then the relationship in between λ_1 and λ_2 will be

(A) $\lambda_1=\lambda_2$ (B) $\lambda_1=3\lambda_2$ (C) $\lambda_1=\lambda_2/3$ (D) $\lambda_1=9\lambda_2$

129. A $150\ Watt$ bulb emits light of wavelength $6600\,\overset{o}{A}$ and only 8% of the energy is emitted as light. How many light photons are emitted by the bulb per second?

(A) 4×10^{19} (B) 3.24×10^{19} (C) 4.23×10^{20} (D) 3×10^{20}

130. A bulb of $40\,W$ is producing a light of wavelength $620\,nm$ with 80% of efficiency then the number of photons emitted by the bulb in 20 seconds are $(1eV=1.6\times10^{-19}\,J, hc=12400\,eV\,\overset{o}{A})$

(A) 2×10^{18} (B) 10^{18} (C) 10^{21} (D) 2×10^{21}

131. The work function for a metal is $4\,eV$. To emit a photo electron of zero velocity from the surface of the metal, the wavelength of incident light should be : ..... $\overset{o}{\text{A}}$

(A) 2700 (B) 1700 (C) 5900 (D) 3100

132. An atom emits energy equal to $4 \times 10^{-12} erg$. To which part of electromagnetic spectrum it belongs :

(A) UV region (B) Visible region

(C) IR region (D) Microwave region

133. A $124\, W$ bulb converts only $15\,\%$ of the energy supplied to it into visible light of wavelength $640\, nm$. How many photons are emitted by the light bulb in one second

(A) 4×10^{19} (B) 6×10^{19} (C) 8×10^{18} (D) 3×10^{19} photon

134. Which of the following isotope of hydrogen has maximum sum of electron $+$ proton $+$ neutron?

(A) P

(B) D

(C) T

(D) All has same value

135. The expression Ze gives :

(A) The charge of $\alpha-$ particle

(B) The charge on an atom

(C) The charge on the nucleus of atomic number Z

(D) The kinetic energy of an $\alpha-$ particle

136. The number of electrons in 2.1 gram-ion of Cl^- is

(A) 2.1

(B) 2.1×18

(C) $2.1 \times 18 \times 6.023 \times 10^{23}$

(D) $2.1 \times 18 \times 6.023 \times 10^{22}$

137. The atomic weight of an element is 39. The number of neutrons in its nucleus is one more than the number of protons. The number of protons, neutrons and electrons respectively in its atom would be

(A) $19, 20, 19$ (B) $19, 19, 20$ (C) $20, 19, 19$ (D) $20, 19, 20$

138. The electronic configuration of a dipositive metal M^{2+} is $2, 8, 14$ and its atomic weight is $56\ a.m.u.$ The number of neutrons in its nuclei would be

(A) 30 (B) 32 (C) 34 (D) 42

139. The compound in which cation is isoelectronic with anion is

(A) $NaCl$ (B) CsF (C) NaI (D) K_2S

140. Iso-electronic species is

(A) F^-, O^{-2} (B) F^-, O (C) F^-, O^+ (D) F^-, O^{+2}

141. An isostere is

(A) NO_2^- and O_3 (B) NO_2^- and PO_4^{3-}

(C) CO_2, N_2O, NO_3^- (D) ClO_4^- and OCN^-

142. Number of protons, neutrons and electrons in the element $^{231}_{89}Y$ is

(A) $89, 231, 89$ (B) $89, 89, 242$ (C) $89, 142, 89$ (D) $89, 71, 89$

143. In neutral atom, which particles are equivalent

(A) p^+, e^+ (B) e^-, e^+ (C) e^-, p^+ (D) p^+, n^o

144. Number of unpaired electrons in inert gas is

(A) 0 (B) 8 (C) 4 (D) 18

145. The atomic number of an element having the valency shell electronic configuration $4s^2 4p^6$ is

(A) 35 (B) 36 (C) 37 (D) 38

146. Compared with an atom of atomic weight 12 and atomic number 6, the atom of atomic weight 13 and atomic number 6

(A) Contains more neutrons (B) Contains more electrons

(C) Contains more protons (D) Is a different element

147. An atom has the electronic configuration of $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^{10}, 4s^2 4p^5$. Its atomic weight is 80. Its atomic number and the number of neutrons in its nucleus shall be

(A) 35 and 45 (B) 45 and 35 (C) 40 and 40 (D) 30 and 50

148. Which of the following are isoelectronic with one another

(A) Na^+ and Ne (B) K^+ and O (C) Ne and O (D) Na^+ and K^+

149. Which one of the following pairs is not correctly matched

(A) Rutherford-Proton (B) J.J. Thomsom-Electron

(C) J.H. Chadwick-Neutron (D) Bohr-Isotope

150. The ratio of specific charge of a proton and an α-particle is

(A) $2:1$ (B) $1:2$ (C) $1:4$ (D) $1:1$

151. Match List I with List II

List $-I$ (Element)		List $-II$ (Electronic Configuration)	
$A.$	N	$I.$	$[\text{Ar}]3\,\text{d}^{10}4\,\text{s}^2\text{4p}^5$

$B.$	S	$II.$	[Ne]$3\ s^2 3p^4$
$C.$	Br	$III.$	[He]$2\ s^2 2p^3$
$D.$	Kr	$IV.$	[Ar]$3\ d^{10} 4\ s^2 4p^6$

Choose the correct answer from the options given below:

(A) $A-IV, B-III, C-II, D-I$

(B) $A-III, B-II, C-I, D-IV$

(C) $A-I, B-IV, C-III, D-II$

(D) $A-II, B-I, C-IV, D-III$

152. Frequency of the de-Broglie wave of election in Bohr's first orbit of hydrogen atom is. . . . . $\times 10^{13}$ Hz (nearest integer).

[Given : R_{H} (Rydberg constant) $= 2.18 \times 10^{-18}$ J.

h(Plank's constant)$= 6.6 \times 10^{-34}$ J.s.]

(A) 600 (B) 657 (C) 658 (D) 660

153. The de-Broglie's wavelength of an electron in the 4^{th} orbit is . . . . . $\pi a_0 .(a_0 =$ Bohr's radius)

(A) 5 (B) 4 (C) 7 (D) 8

154. The value of Rydberg constant (R_H) is 2.18×10^{-18} J. The velocity of electron having mass 9.1×10^{-31} kg in Bohr's first orbit of hydrogen atom $=$ . . . . . $\times 10^5\ \mathrm{ms}^{-1}$ (nearest integer)

(A) 22 (B) 25 (C) 30 (D) 35

155. The candela is the luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency ' A ' $\times 10^{12}$ hertz and that has a radiant intensity in that direction of $\frac{1}{7}$ watt per steradian. $'A'$ and $'B'$ are respectively

(A) 540 and $\frac{1}{683}$ (B) 540 and 683 (C) 450 and $\frac{1}{683}$ (D) 450 and 683

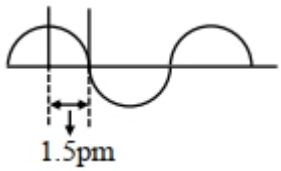
156. Wavenumber for a radiation having $5800\mathring{A}$ wavelength is $x \times 10\ \mathrm{cm}^{-1}$. The value of x is. . . . . .

(A) 1724 (B) 1725 (C) 1727 (D) 1730

157. A hypothetical electromagnetic wave is show below.

(Image)

The frequency of the wave is $\mathrm{x} \times 10^{19}\ \mathrm{Hz}$. $x = \ldots.$ (nearest integer)



(A) 5 (B) 7 (C) 9 (D) 10

158. Total number of ions from the following with noble gas configuration is_____.

$\mathrm{Sr}^{2+}(\mathrm{Z}=38), \mathrm{Cs}^{+}(\mathrm{Z}=55), \mathrm{La}^{2+}(\mathrm{Z}=57) \mathrm{Pb}^{2+}$

$(\mathrm{Z}=82), \mathrm{Yb}^{2+}(\mathrm{Z}=70)$ and $\mathrm{Fe}^{2+}(\mathrm{Z}=26)$

(A) 2 (B) 7 (C) 9 (D) 11

159. Number of spectral lines obtained in He^{+}spectra, when an electron makes transition from fifth excited state to first excited state will be

(A) 11 (B) 10 (C) 12 (D) 13

160. Match List I with List II

List I (Spectral Series for Hyddrogen)	List II (Spectral Region/Higher Energy State)
A. Lyman	I. Infrared region
B. Balmer	II. UV region
C. Paschen	III. Infrared region
D. Pfund	IV. Visible region

Choose the correct answer from the options given below :-

(A) $A-II, B-III, C-I, D-IV$

(B) $A-I, B-III, C-II, D-IV$

(C) $A-II, B-IV, C-III, D-I$

(D) $A-I, B-II, C-III, D-IV$

161. The ionization energy of sodium in kJmol^{-1}. If electromagnetic radiation of wavelength $242\ \mathrm{nm}$ is just sufficient to ionize sodium atom is____.

(A) 494 (B) 490 (C) 499 (D) 445

162. The number of atomic orbitals from the following having 5 radial nodes is ..... .

$7s, 7p, 6s, 8p, 8d$

(A) 3 (B) 2 (C) 1 (D) 4

163. Arrange the following orbitals in decreasing order of energy ?

$(A)\ n=3, 1=0, m=0$

$(B)\ n=4, l=0, m=0$

(C) $n=3, l=1, m=0$

(D) $n=3, l=2, m=1$

The correct option for the order is :

(A) $B>D>C>A$ (B) $D>B>C>A$ (C) $A>C>B>D$ (D) $D>B>A>C$

164. The wave function (Ψ) of $2s$ is given by

$\Psi_{2s}=\frac{1}{2\sqrt{2\pi}}\left(\frac{1}{a_0}\right)^{1/2}\left(2-\frac{r}{a_0}\right)e^{-r/2a_0}$

At $r=r_0$, radial node is formed. Thus, r_0 in terms of a_0

(A) $r_0=a_0$ (B) $r_0=4a_0$ (C) $r_0=\frac{a_0}{2}$ (D) $r_0=2a_0$

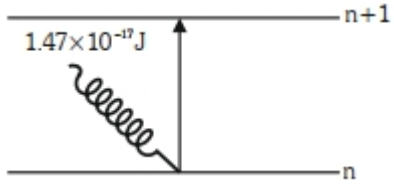
165. The wavelength of an electron of kinetic energy $4.50\times10^{-29}\,J$ is $.....\times10^{-5}\,m$. (Nearest integer)Given : mass of electron is $9\times10^{-31}\,kg, h=6.6\times\ 10^{-34}\,Js$

(A) 6 (B) 5 (C) 4 (D) 7

166. The energy of an electron in the first Bohr orbit of hydrogen atom is $-2.18\times10^{-18}\,J$. Its energy in the third Bohr orbit is ..... .

(A) $\frac{1}{27}$ of this value (B) One third of this value (C) Three times of this value (D) $\frac{1}{9}$ th of this value

167. The electron in the n^{th} orbit of Li^{2+} is excited to $(n+1)$ orbit using the radiation of energy $1.47\times10^{-17}\,J$ (as shown in the diagram). The value of n is .....Given $R_H=2.18\times10^{-18}\,J$



(A) 2 (B) 3 (C) 1 (D) 4

168. Which transition in the hydrogen spectrum would have the same wavelength as the Balmer type transition from $n=4$ to $n=2$ of He^{+}spectrum

(A) $n=2$ to $n=1$ (B) $n=1$ to $n=3$ (C) $n=1$ to $n=2$ (D) $n=3$ to $n=4$

169. Assume that the radius of the first Bohr orbit of hydrogen atom is $0.6\mathring{A}$. The radius of the third Bohr orbit of $He^{+}$is ..... picometer. (Nearest Integer)

(A) 170 (B) 180 (C) 270 (D) 250

170. Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R:

Assertion A: In the photoelectric effect, the electrons are ejected from the metal surface as soon as the beam of light of frequency greater than threshold frequency strikes the surface.

Reason R : When the photon of any energy strikes an electron in the atom, transfer of energy from the photon to the electron takes place.

In the light of the above statements, choose the most appropriate answer from the options given below :

(A) Both A and R are correct but R is NOT the correct explanation of A

(B) A is correct but R is not correct

(C) Both A and R are correct and R is the correct explanation of A

(D) A is not correct but R is correct

171. The total number of isoelectronic species from the given set is .....

$O^{2-}, F^{-}, Al, Mg^{2+}, Na^{+}, O^{+}, Mg, Al^{3+}, F$

(A) 5 (B) 4 (C) 3 (D) 2

172. The orbital angular momentum of an electron in $3s$ orbital is $\frac{xh}{2\pi}$. The value of x is ..... .

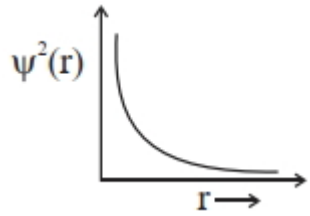
(A) 1 (B) 2 (C) 3 (D) 0

173. The shortest wavelength of hydrogen atom in Lyman series is λ. The longest wavelength in Balmer series of $He^{+}$is

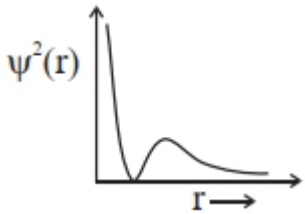
(A) $\frac{5}{9\lambda}$ (B) $\frac{9\lambda}{5}$ (C) $\frac{36\lambda}{5}$ (D) $\frac{5\lambda}{9}$

174. Which of the following is the correct plot for the probability density $\psi^2(r)$ as a function of distance ' r ' of the electron form the nucleus for $2s$ orbital?

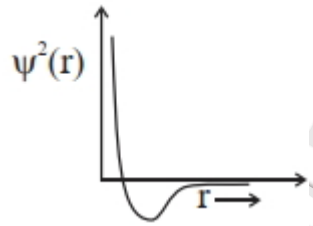
(A)



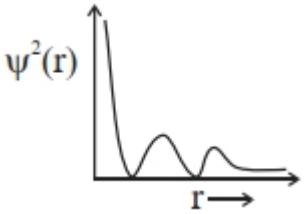
(B)



(C)



(D)



175. The wavelength of an electron and a neutron will become equal when the velocity of the electron is x times the velocity of neutron. The value of x is (Nearest Integer)(Mass of electron is $9.1 \times 10^{-31} kg$ and mass of neutron is $1.6 \times 10^{-27}\, kg$)

(A) 1757 (B) 1758 (C) 1756 (D) 1755

176. If the radius of the 3^{rd} Bohr's orbit of hydrogen atom is r_3 and the radius of 4^{th} Bohr's orbit is r_4. Then ....

(A) $r_4 = \frac{9}{16} r_3$ (B) $r_4 = \frac{16}{9} r_3$ (C) $r_4 = \frac{3}{4} r_3$ (D) $r_4 = \frac{4}{3} r_3$

177. Consider an imaginary ion $^{48}_{22}X^{3-}$. The nucleus contains 'a'% more neutrons than the number of electrons in the ion. The value of 'a' is ..... [nearest integer]

(A) 4 (B) 3 (C) 8 (D) 5

178. The number of radial and angular nodes in $4d$ orbital are, respectively ..... .

(A) 1 and 2 (B) 3 and 2 (C) 1 and 0 (D) 2 and 1

179. The minimum energy that must be possessed by photons in order to produce the photoelectric effect with platinum metal is .... $\times 10^{-19}\, J$

[Given: The threshold frequency of platinum is $1.3 \times 10^{15}\, s^{-1}$ and $h = 6.6 \times 10^{-34}\, J\, s$.]

(A) 32.1 (B) 0.624 (C) 8.58 (D) 976

180. The pair, in which ions are isoelectronic with Al^{3+} is ..... .

(A) Br^- and Be^{2+} (B) Cl^- and Li^+ (C) S^{2-} and K^+ (D) O^{2-} and Mg^{2+}

181. If the uncertainty in velocity and position of a minute particle in space are, $2.4 \times 10^{-26}\left(m\, s^{-1}\right)$ and $10^{-7}\,(m)$ respectively. The mass of the particle in g is .... (Nearest integer)

(Given : $h = 6.626 \times 10^{-34} Js$)

(A) 22 (B) 45 (C) 89 (D) 63

182. If the wavelength for an electron emitted from H atom is $3.3 \times 10^{-10}\, m$, then energy absorbed by the electron in its ground state compared to minimum energy required for its escape from the atom, is ..... times. (Nearest integer).

[Given : $h = 6.626 \times 10^{-34}\, Js$,Mass of electron $= 9.1 \times 10^{-31}$]

(A) 1 (B) 3 (C) 2 (D) 0

183. Which of the following pair is not isoelectronic species? (At. no. $Sm, 62; Er, 68 : Yb, 70 : Lu, 71; Eu, 63 : Tb$, 65; $\mathrm{Tm}, 69$)

(A) Sm^{2+} and Er^{3+}

(B) Yb^{2+} and Lu^{3+}

(C) Tb^{2+} and Tm^{4+}

(D) both (A) and (C) are true

184. A $50\, watt$ bulb emits monochromatic red light of wavelength of $795\ \mathrm{nm}$. The number of photons emitted per second by the bulb is $\mathrm{x} \times 10^{20}$. The value of x is ..... .

[Given : $\mathrm{h} = 6.63 \times 10^{-34}\ \mathrm{Js}$ and $\mathrm{c} = 3.0 \times 10^{8}\ \mathrm{ms}^{-1}$]

(A) 1 (B) 4 (C) 2 (D) 3

185. Radius of 1^{st} orbit of H and some orbit of Be^{3+} is same . Energy of their orbit of Be^{3+} is .....eV

(A) -54.4 (B) -13.6 (C) -108.8 (D) -27.2

186. How many spectral line of Balmer series present in visible region :

(A) 5 (B) 4 (C) 2 (D) 3

187. Which of the following elements outermost orbit's last electron has magnetic quantum number $m = 0$?

(A) Na (B) O (C) Cl (D) N

188. If $n = 2$ for He^{+} ion than .....$\overset{o}{A}$ out the wave length

(A) 3.33 (B) 6.42 (C) 1.47 (D) 2.37

189. In which one of the following pairs of experimental observations and phenomenon does the experimental observation correctly account for phenomenon

(A) X-ray spectraCharge on the nucleus

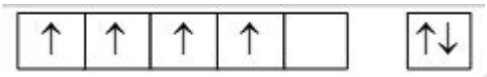
(B) α-particle scatteringQuantized electron orbit

(C) Emission spectraThe quantization of energy

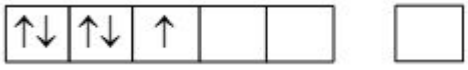
(D) The photoelectric effectThe nuclear atom

190. Which one is the correct outer configuration of chromium

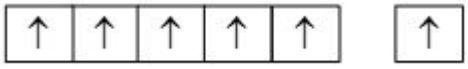
(A)



(B)



(C)



(D)

191. The following sets of quantum numbers represent four electrons in an atom

$(i)\ n = 4, l = 1$ $(ii)\ n = 4, l = 0$

$(iii)\ n = 3, l = 2$ $(iv)\ n = 3, l = 1$

The sequence representing increasing order of energy, is

(A) $(iii) < (i) < (iv) < (ii)$ (B) $(iv) < (ii) < (iii) < (i)$

(C) $(i) < (iii) < (ii) < (iv)$ (D) $(ii) < (iv) < (i) < (iii)$

192. The electrons identified by quantum numbers n and l :

$(A)\, n = 4, l = 1$ $(B)\, n = 4, l = 0$

$(C)\, n = 3, l = 2$ $(D)\, n = 3, l = 1$

can be placed in order of increasing energy as :

(A) $(C) < (D) < (B) < (A)$ (B) $(D) < (B) < (C) < (A)$

(C) $(B) < (D) < (A) < (C)$ (D) $(A) < (C) < (B) < (D)$

193. If the radius of first orbit of H atom is a_0, the de-Broglie wavelength of an electron in the third orbit is

(A) $4\pi a_0$ (B) $8\pi a_0$ (C) $6\pi a_0$ (D) $2\pi a_0$

194. If the kinetic energy of an electron is increased four times, the wavelength of the de-Broglie wave associated with it would become

(A) one fourth (B) half (C) four times (D) two times

195. The energy required to break one mole of $Cl - Cl$ bonds in Cl_2 is $242\, kJ\, mol^{-1}$. The longest wavelength of light capable of breaking a single $Cl - Cl$ bond is ..... nm

($C = 3 \times 10^8\, ms^{-1}$ and $N_A = 6.02 \times mol^{-1}$).

(A) 594 (B) 640 (C) 700 (D) 494

196. Calculate the wavelength (in nanometer) associated with a proton moving at $1.0 \times 10^3\, ms^{-1}$. ..... nm

(Mass of proton $= 1.67 \times 10^{-27}\, kg$ and $h = 6.63 \times 10^{-34}\, Js$)

(A) 0.40 (B) 2.5 (C) 14 (D) 0.32

197. In an atom, an electron is moving with a speed of $600\, m/s$ with an accuracy of 0.005%. Certainity with which the position of the electron can be located is ($h = 6.6 \times 10^{-34}\, kg\, m^2 s^{-1}$, mass of electron, $e_m = 9.1 \times 10^{-31}\, kg$) :

(A) $5.10 \times 10^{-3}\, m$ (B) $1.92 \times 10^{-3}\, m$ (C) $3.84 \times 10^{-3}\, m$ (D) $1.52 \times 10^{-4}\, m$

198. Which one of the following constitutes a group of the isoelectronic species?

(A) C_2^{2-}, O_2^-, CO, NO (B) $NO^+, C_2^{2-}, CN^-, N_2$

(C) $CN^-, N_2, O_2^{2-}, C_2^{2-}$ (D) N_2, O_2^-, NO^+, CO

199. Consider the ground state of $(Z = 24)$. The numbers of electrons with the azimuthal quantum numbers, $l = 1$ and 2 are, respectively

(A) 16 and 4 (B) 12 and 5 (C) 12 and 4 (D) 16 and 5

200. Which one of the following sets of ions represents the collection of isoelectronic species

(A) $K^+, Cl^-, Mg^{2+}, Sc^{3+}$

(B) $Na^+, Ca^{2+}, Sc^{3+}, F^-$

(C) $K^+, Ca^{2+}, Sc^{3+}, Cl^-$

(D) $Na^+, Mg^{2+}, Al^{3+}, Cl$

----- "Success is not the result of spontaneous combustion. You must set yourself on fire." — Arnold H. Glasow -----