Ravi Maths Tuition Centre

Time : 1 Mins **STRUCTURE OF ATOM AND NUCLEAR CHEMISTRY 1** **Marks : 1176**

1. The value of Planck's constant is 6.63 x 10^{-34} Js. The velocity of light is 3.0 x 10^{8} ms^{-1}, Which value is closest to the wavelength in nanometers of a quantum of light with frequency of 8 x 10^{15} S^{-1}?
   a) 4 x 10^{1} b) 3 x 10^{7} c) 2 x 10^{-25} d) 5 x 10^{-18}
2. Assertion: The number of electrons ejected from a metal surface depend upon the frequency of light.
   Reason: There is a time lag between the striking of light beam and the ejection of electrons from the metal surface.
   a) If both assertion and reason are true and reason is the correct explanation of assertion
   b) If both assertion and reason are true but reason is not the correct explanation of assertion
   c) If assertion is true but reason is false d) If both assertion and reason are false
3. The radioactive isotope, tritium $\left({}_{1}^{3}\mathrm{H}\right)$ has a half-lilt of 12.3 years. If the initial amount of tritium is 32 mg, how many milligrams of it would remain after 49.2 years?
   a) 8 mg b) 1 mg c) 2 mg d) 4 mg
4. The angular momentum of an electron present in the excited state of hydrogen is $1.5h/\pi$. The electron is present in
   a) Third orbit b) Second orbit c) Fourth orbit d) Fifth orbit
5. Two atoms are said to be isobars if
   a) they have same atomic number but different mass number
   b) they have same number of electrons but different number of neutrons
   c) they have same number of neutrons but different number of electrons
   d) sum of the number of protons and neutrons is same but the number of protons is different
6. What are the speed and de broglie wavelength of an electron that has been accelerated by a potential difference of 500V?
   a) 5.5 x 10^{-11} m b) 4.5 x 10^{-11} m c) 3.5 x 10^{-11}m d) 6.5 x 10^{-11} m
7. According to Planck's Quantum theory, the correct statements are
   I) The vibrating particle in the black body does not emit continuously.
   II) Radiation is emitted in the form of small packets called Quanta
   III) Energy associated with emitted radiations is inversely propotional to frequency
   IV) The emitted radiant energy is propagated in the form of waves.
   a) I,II,III b) II,III c) I,II,IV d) II,IV,III
8. ${}_{92}\mathrm{U}^{235} + {}_{0}n^{1} \rightarrow$ fission product + neutron $+3.2 \times 10^{-11}$ J The energy released, when 1 g of ${}_{92}\mathrm{U}^{235}$ finally undergoes fission, is:

a) 12.75 x 10^8 kJ b) 18.60 x 10^9 kJ c) 8.21 x 10^7 kJ d) 6.55 x 10^6 kJ

9. The de-Broglie wavelength of a particle with mass 1 g and velocity 100 m/s is
   a) 6.63 x 10^{-33} m b) 6.63 x 10^{-34} m c) 6.63 x 10^{-35} m d) 6.65 x 10^{-36} m
10. Total number of spectral lines when electron jumps from 8th orbit to 2nd orbit
    a) 6 b) 36 c) 21 d) 38
11. What is the colour corresponding to the wavelength of light emitted when the electron in a hydrogen atom undergoes transition from n = 4 to n = 2?
    a) Blue b) Red c) Yellow d) Green
12. Uncertainty in position of a minute particle of mass 25g in space is 10^{-5}m. What is the uncertainty in its velocity
    (in ms^{-1})?(h = 6.6 x 10^{-34} Js)
    a) 2.1 x 10^{-34} b) 0.5 x 19^{-34} c) 2.1 x 10^{-28} d) 0.5 x 10^{-23}
13. The energy of an electron in the first Bohr orbit of H atom is -13.6 eV . The possible energy values (s) of the excited state (s) for electrons in Bohr orbits of hydrogen is (are)
    a) -3.4 eV b) -4.2 eV c) -6.8 eV d) +6.8 eV
14. The angular momentum of 3p-orbitals in terms of h* $\left(h* = \frac{h}{2\pi}\right)$ is:
    a) $\sqrt{2h}$* b) 2h* c) $\frac{h*}{\sqrt{2h}}$ d) h*
15. The orientation of an atomic orbitals is governed by
    a) Spin quantum number b) Magnetic quantum number c) Principal quantum number
    d) Azimuthal quantum number
16. In how many elements the last electron will have the following set of quantum numbers, n = 3 and l = 1?
    a) 2 b) 8 c) 6 d) 10
17. If an electron has spin quantum number $+\frac{1}{2}$ and magnetic quantum number -1, it cannot be present in
    a) d - orbital b) f - orbital c) p - orbital d) s - orbital
18. Accrording to the Bohr Theory which of the following transitions in the hydrogen atom will given rise to the least energetic photon?
    a) n = 6 to n = 1 b) n = 5 to n = 4 c) n = 6 to n = 5 d) n = 5 to n = 3
19. The third line of the Balmer series in the emission spectrum of the hydrogen atom is due to the transition from the
    a) fourth Bohr orbit to the first Bohr orbit b) fifth Bohr orbit to the second Bohr orbit
    c) sixth Bohr orbit to the third Bohr orbit d) seventh Bohr orbit to the third Bohr orbit
20. The azimuthal quantum number indicates __ of the orbital
    a) Size b) Shape c) Orientation d) Spin
21. Which of the following is indicated by the magnetic quantum number?
    a) Size b) Shape c) Spatial orientation d) Spin
22. The frequency of the spectral line obtained when the electron in n = 3 of Hydrogen atom drops to the ground state is
    a) 2.925x10^{15} Hertz b) 2.925x10^{13} Hertz c) 2.925x10^{14} Hertz d) 36559x10^{10} Hertz

23. The energy of a photon is $3x10^{-12}$ ergs. What is its wavelength in nm?($h=6.62x10^{-27}$ erg.sec; $c=3x10^{10}cm.s^{-1}$)
a) 662 nm b) 1324 nm c) 66.2 nm d) 6.62 nm

24. An electron, a proton and an alpha particle have kinetic energies of 16E, 4E and E respectively. What is the qualitative order of their de Broglie wavelengths?
a) $\lambda_e > \lambda_p = \lambda_a$ b) $\lambda_p = \lambda_a > \lambda_e$ c) $\lambda_p > \lambda_e > \lambda_a$ d) $\lambda_a < \lambda_e >> \lambda_p$

25. The angular momentum of an electron in a given stationary state can be expressed as $m_e vr = n\frac{h}{2\pi}$. Based on this expression an electron can move only in those orbits for which its angular momentum is
a) equal to n b) integral multiple of $\frac{h}{2\pi}$ c) multiple of n d) equal to $\frac{h}{2\pi}$ only

26. The energy absorbed by each other molecule (A_2) of a substance is 4.4×10^{-19} J and bond energy per molecule is 4.0×10^{-19} J. The kinetic energy of the molecule per atom will be:
a) 2.2×10^{-19} J b) 2.2×10^{-19} J c) 40×10^{-20} J d) 20×10^{-20} J

27. Consider the following six electronic configurations (remaining inner orbitals are completely filled) and mark the incorrect option.

a) Stability order: IV > II > III b) Order of spin multiplicity: IV > III = I > II
c) V does not violate all the three rules of electronic configuration
d) If IV represents A^+ when kept near a magnet, acts as diamagnetic substance

28. Nitrogen atom has 3 unpaired electrons in its ground state. It can be explained by
a) Auf-bau principle b) Pauli.s principle c) Hund.s rule d) None of these

29. If highest magnetic quantum number of a given atom is represented by 3, then what will be its principal quantum number?
a) 2 b) 3 c) 4 d) 1

30. The energy of the electron in the hydrogen atom depends on
a) The principal quantum number only b) All the quantum numbers
c) The Azimuthal quantum number d) The principal and azimuthal quantum numbers

31. The schrodinger wave equation for hydrogen atom is $\Psi(\text{radial}) = = \frac{1}{16\sqrt{4}}\left(\frac{z}{a_0}\right)^{3/2}$ $\left[(\sigma-1)\left(\sigma^2-8\sigma+12\right)\right]e^{-\sigma/2}$ where ao and z are the constant in which answer can be expressed and maximum position of radial nodes from nucleus are
a) $\frac{a_0}{Z}, \frac{3a_0}{Z}$ b) $\frac{a_0}{2Z}, \frac{a_0}{Z}$ c) $\frac{a_0}{2Z}, \frac{3a_0}{Z}$ d) $\frac{a_0}{2Z}, \frac{4a_0}{Z}$

32. The density of electron cloud of the orbital d_{xy} in yz plane is
a) Zero b) Maximum c) Not determined d) Infinite

33. Consider the following sets of quantum numbers

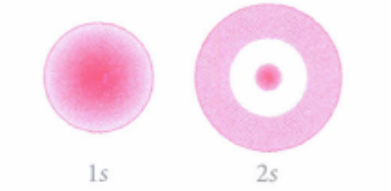
	n	l	m	s
(i)	3	0	0	+1/2

(ii)	2	2	1	+1/2
(iii)	4	3	-2	-1/2
(iv)	1	0	-1	-1/2
(v)	3	2	3	+1/2

Which of the following sets of quantum number is not possible

a) (i), (ii), (iii) and (iv) b) (ii), (iv) and (v) c) (i) and (iii) d) (ii),(iii) and (iv)

34. The probability density plots of Is and 2s atomic orbitals are given in figures.



The density of dots in a region represents the probability density of finding electrons in the region. On the basis of the above diagram, which of the following statements is incorrect?

a) Is and 2s orbitals are spherical in shape

b) The probability of finding the electron is maximum near the nucleus

c) The probability of finding the electron at a given distance is equal in all directions

d)

The probability density of electrons for 2s orbital decreases uniformly as distance from the nucleus increases

35. The hydrogen-like species Li^{2+} is in a spherically symmetric state S_1 with one radial node. Upon absorbing light the ion undergoes transition to a state S_2 The state S_2 has one radial node and its energy is equal to the ground state energy of the hydrogen atom.

The orbital angular momentum quantum number of the state S_2 is

a) 0 b) 1 c) 2 d) 3

36. (A): The energy of ultraviolet radiation is greater than the energy of infrared radiation

(R) : The velocity of ultraviolet radiation is greater than the velocity of infrared radiation

a) Both A and R are true and R is the correct explanation of A

b) Both A and R are true but R is not the correct explanation of A c) A is true and R is false

d) R is true and A is false

37. If n = 6, the correct sequence for filling of electrons will be:

a) $ns \rightarrow (n-1)f \rightarrow (n-1)d \rightarrow np$ b) $ns \rightarrow (n-1)f \rightarrow (n-2)d \rightarrow np$

c) $ns \rightarrow (n-2)f \rightarrow (n-1)d \rightarrow np$ d) $ns \rightarrow np(n-1)d \rightarrow (n-2)f$

38. In photoelectric effect work function of any metal is 2.5 eV. The most energetic emitted electron, are stopped by the potential of -1.5 volt then:

a) energy of incident photons is 4 eV b) energy of incident photons is 1 eV

c) photoelectric current increases when we use photons of high frequency

d) energy of incident photons is 3 eV

39. A cricket ball of mass 0.5 kg is moving with a velocity of 100 $m.s^{-1}$, the wavelength associated with its motion is:

a) 13.25×10^{-26}m b) 13.25×10^{-34}m c) 13.25×10^{-36}m d) 6.6×10^{-34}m

40. The impossible set of quantum numbers is

a) n = 2, l = 0, m = 0, s = + 1/2 b) n = 2, l = 1, m = 0, s = +1/2

c) n = 2, l = 0, m = 1, s =-1/2 d) n = 3, l = 1 m = -1 , s = -1/2

41. The wavelength of moving electron in 3rd Bohr orbit of H-atom is
a) 1×10^{-9} m b) 2×10^{-7}m c) 1×10^{-7} m d) 1×10^{-8} m

42. The ratio of the wave lengths of the first line in the Lyman series of the spectrum of Hydorgen atom and the first line in the Balmer series of the spectrum of He^{+} is :
a) 20/27 b) 27/20 c) 27/5 d) 5/27

43. An ion of a d-block elements has magnetic moment 5.92 B.M. Select the Ion among the following.
a) Zn^{+2} b) Sc^{+2} c) Mn^{+2} d) Cr^{3+}

44. If the velocity of an electron in Bohr's first orbit is 2.19×10^{6} ms^{-1}, what will be the de Broglie wavelength associated with it?
a) 2.19×10^{-6} m b) 4.38×10^{-6} m c) 3.32×10^{-10} m d) 3.32×10^{10} m

45. The number of spherical nodes in 3p-orbital is/are:
a) one b) two c) three d) none of the above

46. If n = 6, the correct sequence for filling of electrons will be:
a) ns $\rightarrow$ (n - 2)f $\rightarrow$(n - 1)d $\rightarrow$ np b) ns$\longrightarrow$ (n-2)f$\longrightarrow$np$\longrightarrow$ (n-l)d c) ns$\longrightarrow$np$\longrightarrow$(n-1)d$\longrightarrow$ (n-2)f
d) ns$\longrightarrow$(n -2)f$\longrightarrow$ (n -1)d$\longrightarrow$ np

47. The de Brogiie wavelength associated with a moving particle of fixed mass is inversely proportional to:
a) Its kinetic energy b) Square root of its kinetic energy c) Square of its kinetic energy
d) Cube of its kinetic energy

48. Electromagnetic radiation of wavelength 242 nm is just sufficient to ionise the sodium atom. What is the ionisation energy of sodium per atom?
a) 494.5×10^{-6} J/atom b) 8169.5×10^{-10} J/atom c) 5.85×10^{-15} J/atom
d) 8.214×10^{-19} J/atom

49. Match the column I with column II and mark the appropriate choice.

Column I (Atom)		**Column II (No. of unpaired electrons)**	
(A)	$_{15}P$	(i)	6 unpaired electrons
(B)	$_{24}Cr$	(ii)	2 unpaired electrons
(C)	$_{26}Fe$	(iii)	3 unpaired electrons
(D)	$_{14}Si$	(iv)	4 unpaired electrons

a) (A) $\longrightarrow$ (ii), (B) $\longrightarrow$ (i), (C) $\longrightarrow$ (iii), (D) $\longrightarrow$ (iv) b) (A) $\longrightarrow$ (i), (B) $\longrightarrow$ (iii), (C) $\longrightarrow$ (ii), (D) $\longrightarrow$ (iv)
c) (A) $\longrightarrow$ (iii), (B) $\longrightarrow$ (i), (C) $\longrightarrow$ (iv), (D) $\longrightarrow$ (ii) d) (A) $\longrightarrow$ (iv), (B) $\longrightarrow$ (ii), (C) $\longrightarrow$ (i), (D) $\longrightarrow$ (iii)

50. Which of the following electron transistions in hydrogen atom will require largest amount of energy?
a) From n = 1 to n = 2 b) From n = 1 to n =3 c) From n = 2 to n =1
d) From n = 3 to n =4

51. The pair of ions having same electronic configuration is _____
a) Cr^{3+}, Fe^{3+} b) Fe^{3+}, Mn^{2+} c) Fe^{3+}, Co^{3+} d) Sc^{3+}, Cr^{3+}

52. An excited hydrogen atom emits a photon of wavelength λ while returning to the ground state. If R is the Rydberg's constant, then the quantum number n of the excited state is

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

53. Table-tennis ball has a mass 10 g and a speed of 100 m/s. If speed can be measured within an accuracy of 10%, what will be the uncertainty in speed and position respectively?
a) 10, 4 x 10^{-33} b) 10, 5.27 x 10^{-34} c) 0.1, 5 x 10^{-34} d) None of these

54. The probability of finding electron in XY plane for P_z- orbital is
a) 100% b) 50% c) 99.9% d) 0%

55. Orbital angular momentum depends on _____
a) l b) n and l c) n and m d) m and s

56. The incorrect electronic arrangement is:
a) 2, 8, 13, 1 b) 2, 8, 12, 2 c) 2, 8, 8, 1 d) 2, 8, 8, 2

57. If r is the radius of the first orbit, the radius of nth orbit of H-atom is given by :
a) rn^2 b) rn c) r/n d) r^2n^2

58. The total energy of electron in an atom is a combination of potential energy (P.E) and kinetic energy (K.L). If total energy is -E for an electron in an atom, then. its (K.E) and (P.E) respectively are
a) 2E, -E b) 2E, E c) E, -2E d) E, -E

59. In Bohr series of lines of hydrogen spectrum, the third line from the red end corresponds to which one of the following inter - orbit jumps of the electron for Bohr orbits in all atom of hydrogen?
a) 3⟶2 b) 5⟶2 c) 4⟶1 d) 2⟶5

60. Assertion: Orbit and orbital are synonymous.
Reason: A circular path around the nucleus in which an electron moves is called orbit or orbital.
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

61. The electron in Bohr's model of hydrogen atom is pictured as revolving around the nucleus in order for it to
a) possess energy b) emit protons c) keep from being pulled into the nucleus
d) keep from being repelled by the nucleus

62. A human body required 0.01 M activity of radioactive substance after 24 hours. Half-life of radioactive substances is 6 hours. Half-life of radioactive substance is 6 hours. The injection of maximum activity of radioactive substance that can injected will be
a) 0.08 M b) 0.04 M c) 0.32 M d) 0.16 M

63. The radius of which of the following orbit is same as that of the first Bohr's orbit of hydrogen atom?
a) He^+ (n = 2) b) Li^{2+} (n = 2) c) Li^{2+} (n = 3) d) Be^{3+} (n = 2)

64. A wave has a frequency of 3x10^{15} sec^{-1}. The energy of that photon is
a) 1.6 x 10^{-12} erg b) 3.2 x 10^{-11} erg c) 2.0 x 10^{-11} erg d) 3x 10^{15} erg

65. Uncertainty in position of an electron (mass = 9.1 x 10^{-28}g) moving with a velocity of 3 x 10^4 cm/s accurate upto 0.001% will be (use $\frac{h}{4\pi}$ in uncertainty expression where h = 6.626 x 10^{-27}erg $^{-}$s)
a) 5.76 cm b) 7.68 cm c) 1.93 cm d) 3.84 cm

66. The uncertainity in the position of an electron (mass 9.1 x 10^{-28}g) moving with a velocity of 3.0 x 10^4 cm.s^{-1} accurate up to 0.011% will be:
a) 0.192 cm b) 7.68 cm c) 0.175 cm d) 3.84 cm

67. If travelling at same speeds, which of the following matter waves have the shortest wavelength?
a) Electron b) Alpha particle (He^{2+}) c) Neutron d) Proton

68. The ratio of energies of two photons of wavelengths 2000 A° and 4000 A°

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

69. How many electrons in an atom with atomic number 105 can have (n + l) = 8?
a) 30 b) 15 c) 17 d) 16

70. An electron is allowed to move freely in a closed cubic box of length of side 10cm. The uncertainty in its velocity will be :
a) 3.35 x 10^{-4}m sec^{-1} b) 5.8 x 10^{-4}m sec^{-1} c) 4 x 10^{-5}m sec^{-1} d) 4 x 10^{-6}m sec^{-1}

71. $_{92}\mathrm{U}^{253}$, nucleus absorbs a neutron and disintegrates into $_{54}\mathrm{Xe}^{139}$, $_{38}\mathrm{Sr}^{94}$ and x. So what will be the product x?
a) 3 - neutrons b) 2 - neutrons c) α-particle d) β-particle

72. **Assertion:** Scientific notation for the number 100 is expressed as 1 x 10^2.
Reason: The number 1 x 10^2 has two significantfigures.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.

73. The momentum of a particle having a de_Broglie wavelength of 10^{-17} m is (Given. h = 6.625 x 10^{-34} m)
a) 3.3125 x 10^{-7} kg m s $^{-1}$ b) 2.65 x 10^{-7} kg m s $^{-1}$ c) 6.625 x 10^{-17} kg m s $^{-1}$
d) 13.25 x 10^{-17} kg m s $^{-1}$

74. Match the constants given in column I with their values given in column II and mark the appropriate choice.

Column I		Column II	
(A)	Rydberg constant	(i)	6.626 x 10^{-34} J s
(B)	Planck's constant	(ii)	3.00 x 10^8 m s^{-1}
(C)	Velocity of light	(iii)	750 x 10^{-9} m
(D)	Wavelength of red light	(iv)	109,677 cm^{-1}

a) (A) ⟶ (iii), (B) ⟶ (ii), (C) ⟶ (i), (D) ⟶ (iv) b) (A) ⟶ (ii), (B) ⟶ (iv), (C) ⟶ (i), (D) ⟶ (iii)
c) (A) ⟶ (i), (B) ⟶ (iii), (C) ⟶ (iv), (D) ⟶ (ii) d) (A) ⟶ (iv), (B) ⟶ (i), (C) ⟶ (ii), (D) ⟶ (iii)

75. How many electrons maximum can have n + 1 = 4 in an atom.

a) 8 b) 2 c) 6 d) 18

76. Maximum number of radial nodes is present in:
a) 5s b) 5p c) 5d d) all have same number of nodes

77. Which of the following explains the sequence of filling electrons in different subshells?
a) Hund's rule b) Aufbau principle c) Pauli's principle d) All of these

78. In the radioactive decay, $_{92}\mathrm{X}^{232} \rightarrow {}_{89}\mathrm{Y}^{220}$, how many α and β-particles are ejected from X to form Y?
a) 3α and 2β b) 5α and 3β c) 3α and 3β d) 3α and 3β

79. Which experiment is responsible for finding out the charge on an electron?
a) Millikan's oil drop experiment b) Cathode ray discharge tube experiment
c) Rutherford's α-rays scattering experiment d) Photoelectric experimen

80. What is the trend of energy of Bohr's orbits?
a) Energy of the orbit increases as we move away from the nucleus
b) Energy of the orbit decreases as we move away from the nucleus
c) Energy remains same as we move away from the nucleus
d) Energy of Bohr's orbit cannot be calculated

81. If uncertainty principle is applied to an object of mass 1 microgram, the uncertainty value of velocity and position will be
a) 0.2 x 10^{-4} m^2s^{-1} b) 0.52 x 10^{6} m^2s^{-1} c) 0.52 x 10^{-28} m^2s^{-1} d) 2 x 10^{-34} m^2s^{-1}

82. The total number of electrons that can be accommodated in all the orbitals having principal quantum number 2 and azimuthal quantum number 1 are:
a) 2 b) 4 c) 6 d) 8

83. The circumference of 3rd Bohr orbit in H-atom is:
a) 3 x 10^{-7}cm b) 3 x 10^{-8}cm c) 3 x 10^{-6}cm d) 4.3 x 10^{-9}cm

84. A 0.66 kg ball is moving with a speed of 100 m/s. The associated wavelength will be (h = 6.6 x 10^{-34} Js) :
a) 1.0 x 10^{-32}m b) 6.6 x 10^{-32}m c) 6.6 x 10^{-34}m d) 1 x 10^{-35}m

85. The frequency of radiation emitted when the electron falls from n = 4 to n = 1 in a hydrogen atom will be (Given ionisation energy of H = 2.18 x 10^{-18}J $atom^{-1}$ and h = 6.625 x 10^{-34} J-s):
a) 1.03 x $10^{15}s^{-1}$ b) 2.00 x $10^{15}s^{-1}$ c) 3.08 x $10^{15}s^{-1}$ d) 1.54 x $10^{15}s^{-1}$

86. Which of the following conclusions regarding the structure of atom is based on Rutherford's α-particle scattering experiment?
a) The positive charge is concentrated in a very small volume of the atom
b) The positive charge is scattered with the electrons throughout the atom
c) The volume occupied by the nucleus is half of the volume of atom
d) Most of the space in the atom is occupied by the neutrons

87. Which of the following species is not stable?
a) $[GeCl_6]^2$ b) $[Sn(OH)_6]2$ c) $[SiCl_6]^{2-}$ d) $[SiF_6]^2$

88. What will be the uncertainty in velocity of a bullet with a mass of 10 g whose position is known with ± 0.01 mm?
a) 5.275 x 10^{-33} m s^{-1} b) 5.275 x 10^{-25} m s^{-1} c) 5.275 x 10^{-5} m s^{-1} d) 5.275 x 10^{-28} ms^{-1}

89. Given below are the spectral lines for an atom of hydrogen. Mark the lines which are not correctly matched with the value of n_1 and n_2?

	Series	n_1	n_2	Region
(i)	Lyman	1	2,3,....	Ultraviolet
(ii)	Balmer	2	3,4,....	Infrared
(iii)	Paschen	3	4,5,....	Infrared
(iv)	Pfund	4	5,6,...	Infrared

a) (i) and (ii) b) (i) and (iii) c) only (iv) d) (i) and (iv)

90. The energy of photon is given as : $\triangle$E/atom= 3.03 x 10^{-19}J $atom^{-1}$, then the wavelength (λ) of the photon is:
a) 6.56 nm b) 65.6 nm c) 656 nm d) 0.656 nm

91. Two values of spin quantum numbers i.e., $\pm$1/2 and -1/2 represent:
a) up and down spin of the electrons respectively
b) two quantum mechanical spin states which refer to the orientation of spin of the electron
c) clockwise and anti-clockwise spin of the electrons respectively
d) anti-clockwise and clockwise spin of the electrons respectively

92. Which of the following series of lines are the only lines in hydrogen spectrum which appear in the visible region.
a) Lyman b) Balmer c) Paschen d) Brackett

93. What will be the wavelength of an electron moving with $\frac{1}{10}$ th of velocity of light?
a) 2.43 x 10^{-11} m b) 243 x 10^{-11} m c) 0.243 m d) 2.43 x 10^{-4} m

94. Which atom (X) is indicated by the following configuration?
X $\longrightarrow$ [Ne] $3s^2$ $3p^3$
a) Nitrogen b) Chlorine c) Phosphorus d) Sulphur

95. Which of the following is not correctly matched?
a) Energy associated with Bohr's orbit, E = $\frac{-2.18\times10^{-18}J\times Z^2}{n^2}$
b) Energy gap between two orbits, $\Delta E=R_H = \left(\frac{1}{n_1^2}-\frac{1}{n_2^2}\right)$
c) Kinetic energy of the ejected electron, $hv=hv_0+\frac{1}{2}mv^2$
d) Energy of one mole of photons, $E=N_0\frac{h\lambda}{c}$

96. The maximum probability of finding an electron of a particular energy in an orbital is about
a) 80% b) 85% c) 95% d) 99%

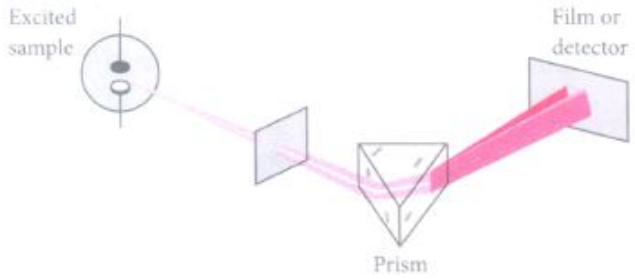
97. Effective nuclear charge (Z_{eff}) for a nucleus of an atom is defined as
a)
shielding of the outermost shell electrons from the nucleus by the innermost shell electrons
b) the net positive charge experienced by electron from the nucleus
c) the attractive force experienced by the nucleus from electron
d) screening of positive charge on nucleus by innermost shell electrons

98. The mass of electron is 9.11 x 10^{-31}kg, Planck's constant is 6.626x 10^{-34}Js, then the uncertainty involved in the measurement of velocity within a distance of 0.1Å is :
a) 5.79 x 10^5 ms^{-1} b) 5.79 x $10^7 ms^{-1}$ c) 5.79 x 10^8 ms^{-1} d) 5.79 x 10^5 ms^{-1}

99. When an electron makes a transition from (n+1) state to n^{th} state, the frequency of emitted radiations is related to 'n' according to (n>>1):

a) v= $\frac{2CRZ^2}{n^3}$ b) v= $\frac{CRZ^2}{n^4}$ c) v= $\frac{CRZ^2}{n^2}$ d) v= $\frac{2CRZ^2}{n^2}$

100. Which of the following types of spectrum is best depicted by the given figure?



a) Atomic absorption spectra b) Atomic emission spectra c) Continuous spectra

d) None of these

101. Which one of the following expressions represent the electron probabilitv function (D)

a) $4\pi r dr\Psi^2$ b) $4\pi r^2 dr\Psi$ c) $4\pi r^2 dr\Psi^2$ d) $4\pi r dr\Psi$

102. The Correct set of four quantum numbers for the valence electron of Rubidium (Z = 37) is

a) 5, 0, 0, +1/2 b) 5, 1, 0, +1/2 c) 5, 1, 1, +1/2 d) 6, 0, 0, +1/2

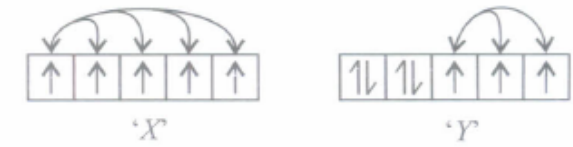
103. Maximum number of electrons in a sub-shell with 1 = 3 and n = 4 is :

a) 14 b) 16 c) 10 d) 12

104. After 3d-sub level is completely filled the differentiating electron enters into __ sub level.

a) 4s b) 4p c) 4f d) 5s

105. Study the orbital diagrams of two atoms 'X and 'y. Which subshell will be more stable and why?



a) X, exchange energy is maximum, so is stability.

b) Y, exchange energy is maximum, so is stability.

c) X, exchange energy is minimum, so stability is maximum.

d) Y, exchange energy is minimum, so stability is maximum.

106. Few electrons have following quantum numbers,

(i) n = 4, l = 1

(ii) n = 4, l= 0

(iii) n = 3, l= 2

(iv) n = 3, l= 1

Arrange them in the order of increasing energy from lowest to highest

a) (iv) < (ii) < (iii) < (i) b) (ii) < (iv) < (i) < (iii) c) (i) < (iii) < (ii) < (iv) d) (iii) < (i) < (iv) < (ii)

107. Calculate the energy in joule corresponding to light of wavelength 45 nm (Planck's constant, h= 6.63 x 10^{-34}Js, speed of light, c= 3 x 10^8 ms^{-1}.) :

a) 6.67 x 10^{15} b) 6.67 x 10^{11} c) 4.42 X 10^{-15} d) 4.42 x 10^{-18}

108. The number of neutrons in the dipositive zinc ion (Mass number or Zn = 65)

a) 35 b) 33 c) 65 d) 67

109. Number of possible spectral lines which may be emitted in Brackett series in H atom, if electrons present in 9th excited level returns to ground level, are
a) 21 b) 6 c) 45 d) 5

110. The frequency of radiation absorbed or emitted when transition occurs between two stationary states with energies E_1 (lower) and E_2 (higher) is given by
a) $v=\frac{E_1+E_2}{h}$ b) $v=\frac{E_1-E_2}{h}$ c) $v=\frac{E_1\times E_2}{h}$ d) $v=\frac{E_2-E_1}{h}$

111. The Bohr's orbit radius for the hydrogen atom (n=1) is approximately 0.53 A. The radius for the first excited state (n = 2) orbit is:
a) 0.27 A b) 1.27 A c) 2.12 A d) 3.12 A

112. Electronic configuration for Cu(Z = 29) is
a) $[Ar]3d^9\ 4s^2$ b) $[Ar]3d^{10}\ 4s^1$ c) $[Ar]3d^5\ 4s^2$ d) $[Ar]3d^6\ 4s^2$

113. The uncertainity in the momentum of a particle is 3.31×10^{-2} $kgms^{-1}$. The uncertainity in its position is(in meters)
a) 1.59×10^{-33} b) 0.33×10^{-30} c) 0.4 x 10-^{20} d) 3.3×10^{-24}

114. Which of the following configurations does not follow Hund's rule of maximum multiplicity?
a) $Is^2\ 2s^2\ 2p^6\ 3s^2\ 3p^2$ b) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^6$ c) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1\ 3d^5$
d) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4\ 4s^2$

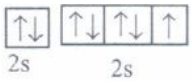
115. If the radius of first Bohr orbit is x pm, then the radius of the third orbit would be
a) (3 × x) pm b) (6 × x) pm c) $\left(\frac{1}{2}\times x\right)$pm d) (9 × x) pm

116. A helium atom at 300 K is moving with a velocity of 2.40 × 10^2 ms^{-1}. The de-Broglie wavelength is about [At. Wt. of He = 4.0]
a) 0.416 nm b) 0.83 nm c) 803 Å d) 8000 Å

117. In which of the following Aufbau principle is violated?
a) 

b) 

c) 

d) 

118. The number of different spatial arrangements for the orbital with l = 2 is
a) 1 b) 3 c) 5 d) 7

119. The following quantum numbers are possible for how many orbitals(s) n = 3, l = 2, m = +2?
a) 1 b) 3 c) 2 d) 4

120. Energy equal to the mass of one electron is:
a) 8.2 x 10-^{7}erg b) 9.2 x 10-^{8}erg c) 8.2 x 10-^{10}erg d) 4.1 x 10-^{8}erg

121. What is the velocity of electron present in first Bohr orbit of hydrogen atom?
a) 2.18×10^5 m/s b) 2.18×10^5 m/s c) 2.18×10^6 m/s d) 2.18×10^{-9} m/s

122. The orbital angular momentum of a p-electron is given as
a) $\sqrt{\frac{h}{\sqrt{2\pi}}}$ b) $\sqrt{3}\frac{h}{\sqrt{2\pi}}$ c) $\sqrt{\frac{3}{2}}\frac{h}{2\pi}$ d) $\sqrt{6}\cdot\frac{h}{2\pi}$

123. Bohr's theory is applicable to
a) Li^{2+} b) Li^{+} c) He^{+} d) Both 1 and 3

124. The de-Broglie's wavelength (A) of the electron subjected to an accelerating potential of V volts is given by
a) $\frac{eh}{\sqrt{2mV}}$ b) $\frac{h}{\sqrt{2meV}}$ c) $\frac{h}{\sqrt{2me}}\times V$ d) $\frac{mh}{\sqrt{2eV}}$

125. The electronic configuration of Cu (Atomic No. = 29) is :
a) $1s^2$, $2s^2$ $2p^6$, $3s^2$ $3p^6$, $4s^2$, $3d^9$ b) $1s^2$,$2s^2$$2p^6$, $3s^2$$3p^6$, $3d^{10}$, $4s^1$
c) $1s^2$, $2s^2$ $2p^6$, $3s^2$ $3p^6$, $4s^2$ $4p^6$, $5s^2$ $5p^l$ d) $1s^2$, $2s^2$ $2p^6$, $3s^2$ $3p^6$, $4s^2$ $4p^6$, $3d^3$

126. In hydrogen atom, energy of first excited state is - 3.4 eV. Then, KE of same orbit of hydrogen atom is:
a) + 3.4 eV b) + 6.8 eV c) -13.6 eV d) + 13.6 eV

127. The number of d-electrons retained in Fe^{2+} (atomic number Fe = 26) ion is
a) 3 b) 4 c) 5 d) 6

128. The total number of atomic orbitals in fourth energy level of an atom is:
a) 8 b) 16 c) 32 d) 4

129. If uncertainity in position and velocity are equal then uncertainity in momentum will be:
a) $\frac{1}{2}\left(\frac{mh}{\pi}\right)^{\frac{1}{2}}$ b) $\frac{1}{2}\sqrt{\frac{h}{\pi m}}$ c) $\frac{h}{4\pi m}$ d) $\frac{mh}{4\pi}$

130. In an hydrogen atom which of the following transition should be associated with highest absorption of energy
a) n = 1 to n = 4 b) n = 2 to n = 3 c) n = 4 to n = 1 d) n = 3 to n = 2

131. Radius of 3rd Bohr orbit of hydrogen atom is:
a) 6.529A^o b) 2.116A^o c) 4.761A^o d) 8.464A^o

132. The orbitals are called degenerate when:
a) they have the same wave functions
b) they have the same wave functions but different energies
c) they have different wave functions but same energy d) they have the same energy

133. When an electron with charge 'c' and mass 'm ' moves with velocity 'v' around the nucleus having nuclear charge 'Z' in a circular orbit of radius 'r', the potential energy of electron is
a) $\frac{Ze^2}{r}$ b) $\frac{Ze^2}{r^2}$ c) $\frac{-Ze^2}{r}$ d) $\frac{mv^2}{r}$

134. The momentum of a particle of wave length 1Å is
a) 6.625 x 10^{-27} g. cm.s $^{-1}$ b) 6.625 x 10^{-19} g.cm.s^{-1} c) 6.625 x 10^{-16} g.cm.s^{-1}
d) 6.625 x 10^{-23} g. cm.s^{-1}

135. Energy of a photon with a wave length of 450 nm is
a) 4.36x10^{-12} ergs b) 4.36x10^{-13} ergs c) 4.36x10^{-20} ergs d) 4.36x10^{-11} ergs

136. An electron can enter into the orbital when
a) value of n is minimum b) value of l is minimum c) value of (n + l) is minimum
d) value of (n + m) is minimum

137. Which of the following sets of four quantum numbers, an electron will have the highest energy?

a)

	n	l	m	s
(a)	3	2	1	$\frac{1}{2}$

b)

	n	l	m	s
(b)	4	2	-1	$\frac{1}{2}$

c)

	n	l	m	s
(c)	4	1	0	$-\frac{1}{2}$

d)

	n	l	m	s
(d)	5	0	0	$-\frac{1}{2}$

138. Which of the following observations was not correct during Rutherford's scattering experiment?

a) Most of the α-particles passed through the gold foil undeflected

b) A small fraction of the α-particles was deflected by small angles

c) A large number of the α-particles were bounced back

d) A very few α-particles (~1 in 20,000) were bounced back

139. Which of the following ions has the least magnetic moement?
a) Cu^{2+} b) Ni^{2+} c) Co^{3+} d) Fe^{2+}

140. Rutherford's alpha ray scattering experiment showed for the first time that the atom has
a) Nucleus b) Proton c) Electron d) Neutron

141. An atom differs from its ion in
a) Nuclear charge b) Mass number c) Number of electrons d) Number of neutrons

142. What are the possible values of n, l and m_1 for an atomic orbital 4f?
a) n = 4, l = 0, 1, 2, 3, m_1 = -2, -1, 0, +1, +2 b) n = 4, l = 3, m_1 = -3, -2, -1, 0, +1, +2, +3
c) n = 4, l = 2, m_1 = -2, -1, 0, +1, +2, +3 d) n = 4, l = 0, 1, m_1 = -1, 0, +1

143. The maximum number of electrons in a sub-shell is given by the expression.
a) (l + 2) b) (2l + 2) c) (4l + 2) d) (l + 1)

144. The hydrogen-like species Li^{2+} is in a spherically symmetric state S_1 with one radial node. Upon absorbing light the ion undergoes transition to a state S_2 The state S_2 has one radial node and its energy is equal to the ground state energy of the hydrogen atom.
The state S_1 is
a) 1s b) 2s c) 2p d) 3s

145. The age of most ancient geological formation is estimated by
a) potassium-argon method b) carbon-14 dating method c) radium- silicon method
d) uranium-lead method

146. The correct set of quantum numbers for the unpaired electron of chlorine atom is:
a) 2,0,0,+$\frac{1}{2}$ b) 2,1,-1,+$\frac{1}{2}$ c) 3,1,1,$\pm\frac{1}{2}$ d) 3,0,0,$\pm\frac{1}{2}$

147. What is the atomic number of the element which has $3d^6$ as its outermost configuration?
a) 12 b) 32 c) 26 d) 24

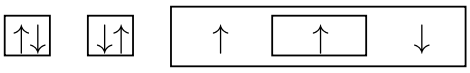
148. An electron in excited hydrogen atom falls from fifth energy level to second energy level. In which of the following regions, the spectral line will be observed and is part of which series of the atomic spectrum?
a) Visible, Balmer b) Ultraviolet, Lyman c) Infrared, Paschen d) Infrared, Brackett

149. What minimum amount of energy is required to bring an electron from ground state of Be^{3+} to in infinity?
a) 4.358 x 10^{-18} J/atom b) 2.179 x 10^{-18} J/atom c) 3.4864 x 10^{-17} J/atom
d) 8.716 x 10^{-18} J/atom

150. In hydrogen atom the kinetic energy of electron is 3.4 eV. The distance of that electron from the nucleus
a) 2.11A° b) 0.529A° c) 1.587A° d) 21.16A°

151. If r is the radius of the first orbit, the radius of nth orbit of H-atom is given by
a) rn^2 b) rn c) $\frac{r}{n}$ d) r^2n^2

152. What are the maximum number of electrons that can be associated with the following set of quantum numbers? n = 3, 1 = 1 and m = 1.
a) 10 b) 6 c) 4 d) 2

153. 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.
The electronic configuration of N atom is
c) 

d) The value of m for dz^2 is zero

154. Which of the following configuration is correct for iron ?
a) $1\ s^2, 2\ s^2 2p^6, 3\ s^2 3p^6 3\ d^5$ b) $1\ s^2, 2\ s^2 2p^6, 3\ s^2 3p^6, 4\ s^2, 3\ d^5$
c) $1\ s^2, 2\ s^2 2p^6, 3\ s^2 3p^6, 4\ s^2, 3\ d^7$ d) $1\ s^2, 2\ s^2 2p^6, 3\ s^2 3p^6 3\ d^6, 4\ s^2$

155. Which of the following is diamagnetic?
a) He^{+2} b) Sc^{+3} c) Mg^{+2} d) O^{-2}

156. If the ionisation energy of hydrogen atom is 13.6 eV, the energy required to excite it from ground state to the next higher state is approximately:
a) 3.4 eV b) 10.2 eV c) 17.2 eV d) 13.6 eV

157. The radius of which of the following orbit is same as radius of pt orbit of H
a) He^+(n=2) b) Li^{2+}(n=2) c) Li^{2+}(n=3) d) Be^{3+}(n=2)

158. The number of electrons which will together weigh one gram
a) 1.098 x 10^{27} electrons b) 9.1096 x 10^{31} electrons c) 1 electron d) 1 x 10^4 electrons

159. The electrons, identified by n & 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)

160. The minimum and maximum values of wavelength in the Lyman series of a H atom are, respectively:
a) 364.3 nm and 653.4 nm b) 91.2 nm and 121.5 nm c) 41.2 nm and 102.6 nm
d) 9.12 nm and 121. 5 nm

161. The position of both, an electron and a helium atom is known within 1.0 mm. Further the momentum of the electron is known within 5.0 x 10^{-26} kg ms^{-1}. The minimum uncertainty in the measurement of the momentum of the helium atom is :
a) 50 kg ms^{-1} b) 80 kg ms^{-1} c) 80 x 10^{-26} kg ms^{-1} d) 5.0 x 10^{-26} kg ms^{-1}

162. The ratio of wavelength values of series limit lines($n_2=\infty$) of Balmer series and paschen series are
a) 4:9 b) 9:4 c) 2:3 d) 3:2

163. Which one of the following pairs of ions have the same electronic configuration:
a) Cr^{3+}, Fe^{3+} b) Fe^{3+}, Mn^{2+} c) Fe^{3+}, Co^{3+} d) Sc^{3+}, Cr^{3+}

164. In the photoelectron emission, the energy of the emitted electron is
a) greater than the incident photon b) same as that of the incident photon
c) smaller than the incident photon d) proportional to the intensity of incident photon

165. An electron has magnetic quantum number as '-3'. Its principal quantum number is
a) 3 b) 2 c) 1 d) 4

166. The two electrons occupying an orbital are distinguished by
a) Principal quantum number b) Azimuthal quantum number
c) Magnetic quantum number d) Spin quantum number

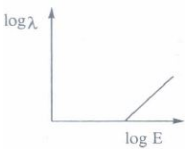
167. The energy of the electron when it is at an infinite distance from the nucleus is
a) Infinity b) Zero c) Minimum d) Can not be predicted

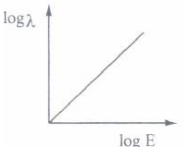
168. The energy of an electron in the nth Bohr orbit of hydrogen atom is:
a) $-\frac{13.6}{n^4}\mathrm{eV}$ b) $-\frac{13.6}{n^3}\mathrm{eV}$ c) $-\frac{13.6}{n^2}\mathrm{eV}$ d) $-\frac{13.6}{n}\mathrm{eV}$

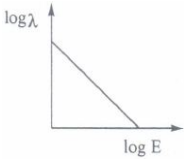
169. The wavelength of radiation required to remove the electron of hydrogen atom (Ionisation energy 21.7 x 10^{-12}erg) from n = 2 orbit to n =∞ is
a) 3.664x10^{-4} cm b) 3.66x10^{-5} cm c) 3.66x10^{-6} cm d) 3.66x10^{-7} cm

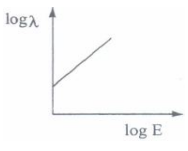
170. As an electron is brought from an infinite distance close of nucleus of the atom, the energy of electron:
a) Increases to a greater +ve value b) Decreases to a smaller +ve value
c) Increases to a greater -ve value. d) Decreases to a smaller -ve value

171. The correct set of four quantum numbers for the valence electron of rubidium atom (Z=37) is:
a) 5, 1 + 1/2 b) 6, 0, 0 + 1/2 c) 5, 0, 0 + 1/2 d) 5, 1, 0 + 1/2

172. The graph between energy of an electron and its de-Broglie wavelength λ is
a) 

b) 

c) 

d) 

173. The orbital diagram in which the Aufbau principle is violated is
a)  b)  c)  d) 

174. The value of planck's constant is 6.63 x 10^{-34} Js. The velocity of light is 3.0 x 10^8 ms^{-1}. Which value is closet to the wavelength in nonometers of a quantum of light with frequency, of 8 x 10^{15} s^{-1}?
a) 3 x 10^7 b) 2 x 10^{-25} c) 5 x 10^{18} d) 4 x 10^1

175. Radial part of the wave function depends on quantum numbers
a) n and l b) n and s c) l and m d) l and s

176. The ratio of the orbit of the 1st three radii in an atom of hydrogen is
a) 1 : 4 : 9 b) 9 : 4 : 1 c) 1 : 2 : 3 d) 3 : 2 : 1

177. Sulphur = 35 (34.96903 u) emits a β-particle but no γ-ray . The product is chlorine = 35 (34.96885 u). The maximum energy emitted by the β-particle is:
a) 16.758 MeV b) 1.6758 MeV c) 0.16758 MeV d) 0.016758 MeV

178. What will be the wave number of yellow radiation having wavelength 240 nm?
a) 1.724 x 10^4 cm^{-1} b) 4.16 x 10^6 m^{-1} c) 4 x 10^{14} Hz d) 219.3 x 10^3 cm^{-1}

179. If the energy of H-atom in the ground state is -E, the velocity of photo-electron emitted when a photon having energy E_p strikes a stationary Li^{2+} ion in ground state, is given by:

a) $v=\sqrt{\frac{2\left(E_p-E\right)}{m}}$ b) $v=\sqrt{\frac{2\left(E_p+9E\right)}{m}}$ c) $v=\sqrt{\frac{2\left(E_p-9E\right)}{m}}$

d) $v=\sqrt{\frac{2\left(E_p-3E\right)}{m}}$

180. The police are monitoring an automobile of mass 2.0 tons speeding along a high way. They are certain about location of the vehicle only to with in 1m; what is the minimum uncertainty in the speed of the vehicle?
a) 3.9 x 10^{-38} ms-1 b) 12.4 x 10^{-38} ms^{-1} c) 2.63 x 10^{-38} ms^{-1} d) 0.62 x 10^{-38} ms^{-1}

181. A nuclide of an alkaline earth metal undergoes radioactive decay by emission of the $\alpha-$ particles is succession. The group of the periodic table to which the resulting daughter element would belong to:
a) Gr.4 b) Gr.16 c) Gr.14 d) Gr.16

182. The number of angular nodal planes are same in the orbitals:
a) 3p and 4p b) 3s and 4d c) 4s and 3p d) 4s and 3d

183. Number of neutrons in a parent nucleus X, which gives ${}_7\mathrm{N}^{14}$ nucleus after two successive β -emissions would be
a) 9 b) 6 c) 7 d) 8

184. Bohr's theory can also be applied to the ions like
a) He^+ b) Li^{2+} c) Be^{3+} d) all of these

185. If the shortest wavelength in Lyman series of H atom is x, then longest wavelength in Balmer series of He^+ is
a) $\frac{36x}{5}$ b) $\frac{x}{4}$ c) $\frac{9x}{5}$ d) $\frac{5x}{9}$

186. Two electrons present in M shell will differ in
a) principal quantum number b) azimuthal quantum number
c) magnetic quantum number d) spin quantum number

187. An element E loses one α and two -particles in three successive stages. The resulting element will be
a) an isobar of E b) an isotone of E c) an isotope of E d) E itself

188. A proton and an α-particle are accelerated through the same potential difference. The ratio of their De Broglie wavelength is:
a) $\sqrt{2}$ b) $\frac{1}{\sqrt{2}}$ c) $2\sqrt{2}$ d) 2

189. Which of the following designation is impossible?
a) 4f b) 5g c) 2d d) 6p

190. If ionisation potential for hydrogen atom is 13.6 eY, then ionisation potential for He^+ will be:
a) 54.4 eV b) 6.8 eV c) 13.6 eV d) 24.5 eV

191. A hydrogen like species(atomic number Z) is present in a higher exited state of quantum number n. This excited atom can make a transition to the first excited state by successive emission of two photons of energies 10.20 eV and 17.0 eV respectively. Alternatively, the atom

from the same excited state can make a tranition to the second excited state by sucessive emission of two photons of energy 4.25 eV and 5.95 eV respectively. Determine the value of Z,
a) 1 b) 2 c) 3 d) 4

192. The equation corresponding to the wave number of spectral lines in Pfund series is
a) $R\left[\frac{1}{4^2}-\frac{1}{5^2}\right]$ b) $R\left[\frac{1}{3^2}-\frac{1}{4^2}\right]$ c) $R\left[\frac{1}{2^2}-\frac{1}{3^2}\right]$ d) $R\left[\frac{1}{5^2}-\frac{1}{6^2}\right]$

193. What will be the mass of a particle if uncertainty in its position is 10^{-8} m and velocity is 5.26 x 10^{-25} ms^{-1}?
a) 0.01 kg b) 0.1 kg c) 1 kg d) 10 kg

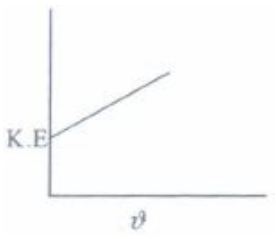
194. If first ionization potential of an atom is 16 V, then the first excitation potential will be:
a) 10.2 V b) 12 V c) 14 V d) 16 V

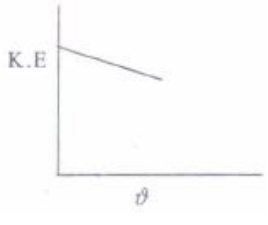
195. Wavelength of an electron is $5A^{\circ}$. Velocity of the electron is:
a) 1.45 x 10^8 cm/s b) 1.6 x 10^{-8} cm/s c) 3.2 x 10^{-27} cm/s d) 3.2 x 10^{27} cm/s

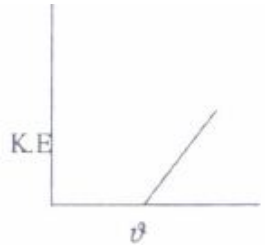
196. The energy of an electromagnetic radiation is 3 x 10^{-12}ergs. What is its wavelength in nanometers?
(h = 6.625 x 10^{-27} erg. sec, C = 3 x 10^{10} cm, sec^{-1})
a) 400 b) 228.3 c) 3000 d) 662.5

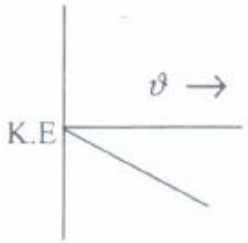
197. The de Broglie wave length of a riffle bullet of mass 2 grams moving with a velocity of 2m/sec is
a) $\frac{6.6\times10^{-34}}{2\times2}m$ b) $\frac{6.6\times10^{-27}}{2\times10^{-3}\times2}cm$ c) $\frac{6.6\times10^{-34}}{2\times10^{-3}\times2}m$ d) $\frac{6.6\times10^{-27}}{2\times2}m$

198. Which of the following graphs represents photoelectric effect

a) 

b) 

c) 

d) 

199. How many number of electrons are present in a particle which carries a charge of 5.5 x 10^{-16} C?
a) 3432 b) 1560 c) 8240 d) 2432

200. The uncertainity in position and velocity of a particle are 10^{-10}m and 5:27 x $10^{-24}$$ms^{-1}$ respectively, Calculate the mass of the particle. (h = 6.625 x 10^{-34} J-s).
a) 0.099 kg b) 1 kg c) 2 kg d) 10 kg

201. The measurement of the electron position if associated with an uncertainty in momentum, which is equal to 1 x 10^{18} g cm s^{-l}. The uncertainty in electron velocity is, (mass of an electron is 9 x 10^{-28} g).
a) 1 x 10^9 cms^{-1} b) 1 x 10^6 cms^{-1} c) 1 x 10^5 cms^{-1} d) 1 x 10^{11} cms^{-1}

202. The change in velocity when electron jumps from the first orbit to the second orbit is
a) Half its original velocity b) Twice its original velocity c) One fourth its original velocity
d) Equal to its original velocity

203. The Schrodinger wave equation for hydrogen atom is $\Psi_{2s} = \frac{1}{4\sqrt{2\pi}}\left(\frac{1}{a_0}\right)^{3/2}\left(2-\frac{r_0}{a_0}\right)e^{-r/a_0}$ where a_0 is is Bohr's radius. If the radial node in 2s be at r_0 would be equal to:
a) $\frac{a_0}{2}$ b) $2a_0$ c) $\sqrt{2a_0}$ d) $\frac{a_0}{\sqrt{2}}$

204. Three energy levels P. Q, R of a certain atom are such that $E_p < E_Q < E_R$. If λ_1, $\lambda_2$and λ_3 are the wave length or radiation corresponding to transition R → Q ; Q → P and R → P respectively. The correct relationship between λ_1, λ_2 and λ_3 is
a) $\lambda_1+\lambda_2=\lambda_3$ b) $\frac{1}{\lambda_3}=\frac{1}{\lambda_1}+\frac{1}{\lambda_2}$ c) $\lambda_3=\sqrt{\lambda_1\lambda_2}$ d) $\frac{2}{\lambda_3}=\frac{1}{\lambda_1}+\frac{1}{\lambda_2}$

205. For azimuthal quantum number 1 = 3, the maximum number of electrons will be :
a) 2 b) 6 c) 0 d) 14

206. 

represents
a) 4s b) 5p c) 3s d) $6d_{xy}$

207. When an electron of charge e and mass m moves with a velocity V about the nuclear charge Ze in circular orbit of radius r, the potential energy of the electrons is given by :
a) Z^2e^2/r b) $-Ze^2/r$ c) Ze^2/r d) $m\upsilon^2/r$

208. The numerical value $\Psi_{4,3,0}$ denotes:
a) 3d-orbital b) 4f-orbital c) 2s-orbital d) 4d-orbital

209. Emission of an alpha particle leads to a
a) decrease of 2 units in the charge of the atom
b) increase of 2 units in the mass of the atom
c) decrease of 2 units in the mass of the atom
d) increase of 4 units in the mass of the atom

210. Which of the following configurations represents a noble gas?
a) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^6\ 4d^{10}\ 5s^2$ b) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4f^{14}\ 5s^2$
c) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^6\ 4d^{10}\ 5s^2\ 5p^6$
d) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^6\ 4d^{10}\ 5s^2\ 5p^3$

211. Which one of the following statements is wrong?
a) The uncertainty principle is
b)
Half filled and fully filled orbitals have greater stability due to greater exchange energy, greater symmetry and more balanced arrangement
c)
The energy of 2s orbitals is less than the energy of - 2p orbitals in case of Hydrogen like atoms
d)
de-Broglie's wavelength is given by $\lambda=\frac{h}{mv}$ where m = mass of particle, v = velocity of the particle

212. Kinetic energy of photoelectrons is independence _____of incident radiation

a) Wavelength b) Wave number c) Frequency d) Intensity

213. The orbital angular momentum of an electron in p-orbital makes an angle of 45° from Z-axis. Hence Z-component of orbital angular momentum of electron is :

a) $\frac{h}{\pi}$ b) $\left(\frac{h}{2\pi}\right)$ c) $-\frac{h}{\pi}$ d) $\left(-\frac{h}{2\pi}\right)$

214. Which of the following is responsible to rule out the existence of defence of definite paths or trajectories of electrons?

a) Pauli's exclusion principle b) Heisenberg's uncertainty principle

c) Hunds rule of maximum multiplicity d) Aufbau principle

215. Assertion: In electromagnetic spectrum, the small portion around 10^{15} Hz is called visible light.
Reason: Visible region is only a small part of the entire spectrum which our eyes can see.

a) If both assertion and reason are true and reason is the correct explanation of assertion

b) If both assertion and reason are true but reason is not the correct explanation of assertion

c) If assertion is true but reason is false d) If both assertion and reason are false

216. Read the following statements and mark the incorrect statement.

a) No two electrons in an atom can have all the four quantum numbers same

b) All the orbitals in a subshell are first occupied singly with parallel spins

c) The outer electronic configuration of chromium atom is $3d^4\ 4s^2$

d) Lyman series of hydrogen spectrum lies in ultraviolet region

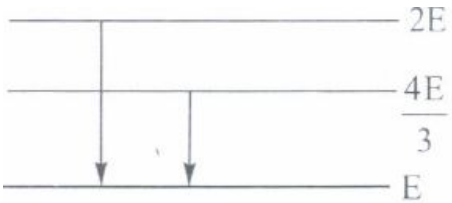
217. A particle of mass one microgram is confined to move along one direction (x-axis) within a region 1 mm in extension. What is the uncertainity in its velocity?

a) $3.313 \times 10^{-20}\ cm^{-1}$ b) $5.012 \times 10^{-20}\ cm^{-1}$ c) $8.325 \times 10^{-20}\ cm^{-1}$ d) $5.27 \times 10^{-21}\ cm^{-1}$

218. The ratio of number of spectral lines obtained when an e^- jumps from 7th to ground to 6th to 3rd

a) 7 b) 3.5 c) 10 d) 2.5

219. The given diagram indicates the energy levels of certain atom. When an electron moves from 2E level to E level, a photon of wavelength λ is emitted. The wavelength of photon emitted during its transition from $\frac{4E}{3}$ level to E level is



a) $\frac{\lambda}{3}$ b) $\frac{3\lambda}{4}$ c) $\frac{4\lambda}{3}$ d) 3λ

220. When alpha particles are sent through a thin metal foil, most of them go straight through the foil because

a) Alpha particles are much heavier than electrons

b) Alpha particles are positively charged c) Most part of the atom is empty

d) Alpha particles move with high velocity

221. In a hydrogen atom, energy of first excited state is -3.4 eV. Find out KE of the same orbit of hydrogen atom

a) +3.4 eV b) +6.8 eV c) -13.6 eV d) +13.6 eV

222. The kinetic energy of the photo electrons does not depend upon
a) Intensity of incident radiation b) Frequency of incident radiation
c) Wavelength of incident radiation d) Wave number of the incident radiation

223. What does the negative electronic energy (negative sign for all values of energy) for hydrogen atom means
a)
The energy of an electron in the atom is lower than the energy of a free electron at rest which is taken as zero
b)
When the electron is free from the influence of nucleus it has a negative value which becomes more negative
c)
When the electron is attracted by the nucleus the energy is absorbed which means a negative value
d) Energy is released by hydrogen atom in ground state

224. The number of photons of light wave number 'x' in 10 J of energy source is:
a) 10 hcx b) $\frac{hc}{10x}$ c) $\frac{10}{hcx}$ d) $\frac{hcx}{10}$

225. Few statements are given regarding nodes in the orbitals. Mark the statement which is not correct.
a) In case of p_z - orbital, xy plane is a nodal plane b) ns - orbital has (n + 1) nodes
c) The number of angular nodes is given by l
d)
The total number of nodes is given by (n - 1) i.e. sum of l angular nodes and (n -l- 1) radial nodes

226. How many electrons in an atom have the following quantum numbers?
n=4, m_s =-1/2
a) 32 b) 18 c) 8 d) 16

227. Which of the following statements is not correct about the characteristics of cathode rays?
a) They start from the cathode and move towards the anode
b) They travel in straight line in the absence of an external electrical or magnetic field
c)
Characteristics of cathode rays do not depend upon the material of electrodes in cathode ray tube
d)
Characteristics of cathode rays depend upon the nature of gas present in the cathode ray tube

228. Compare the energies of two radiations E_1 with wavelength 800 nm and E_2 with wavelength 400 nm.
a) $E_1=2E_2$ b) $E_1=E_2$ c) $E_2=2E_1$ d) $E_2=-\frac{1}{2}E_1$

229. The kinetic energy of an electron in an orbit of hydrogen atom is 3.4ev/atom. Then identify the correctly matched set for that electron

List 1	List 2
A) Potential energy	1.09x 10^8 cm/sec
B) Total energy	2.116x 10^{-8} cm
C) Velocity	-6.8ev/atom
D) Its distance from nucleus	-3.4 ev/atom

The correct match is

a)

A	B	C	D
4	3	2	1

b)

A	B	C	D
2	1	4	3

c)

A	B	C	D
3	4	1	2

d)

A	B	C	D
3	4	2	1

230. In potassium the order of energy levels is
a) 4s > 3d b) 4s < 3d c) 4s < 3p d) 4s = 3d

231. An ion has 18 electrons in the outermost shell, it is:
a) Cu^+ b) Th^{4+} c) Cs^+ d) K^+

232. An electron of velocity 'x' is found to associate with a wave. The velocity to be possessed by the neutron to have half the de-Broglie wavelength possessed by electron is
a) $\frac{x}{1840}$ b) $\frac{x}{1480}$ c) $\frac{x}{920}$ d) 1840 x

233. The electronic configuration of an element with atomic number 29 is:
a) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^9, 4s^2$ b) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^{10}, 4s^1$
c) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^8, 4s^2, 3p^1$ d) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^7, 4s^2, 4p^2$

234. The charge of an electron is 1.6 x 10^{-19} coulombs. What will be the value of charge on Na^+ ion?
a) 1.6 x 10^{-19} C b) 3.2 x 10^{-19} C c) 2.4 x 10^{-19} C d) 11x1.6 x 10^{-19} C

235. What will be the energy of one photon of radiation whose frequency is 5 x 10^{14} Hz?
a) 199.51 kJ b) 3.3 x 10^{-19} J c) 6.626 x 10^{-34} J d) 2.31 x 10^5 J

236. The probability of finding an electron in p_y orbital along the x-axis is:
a) Maximum b) Zero c) Not determined d) Infinite

237. Which of the following species is isoelectronic with CO?
a) HF b) N_2 c) N_2^+ d) O_2^-

238. The maximum orbital angular momentum of an electron with n = 5 is
a) $\sqrt{6}\frac{h}{2\pi}$ b) $\sqrt{12}\frac{h}{2\pi}$ c) $\sqrt{42}\frac{h}{2\pi}$ d) $\sqrt{20}\frac{h}{2\pi}$

239. The energy absorbed by the electron is
a) 8.5 eV b) 3.4 eV c) 68 eV d) 3.78 eV

240. Assertion: X-rays are used to study the interior of the objects.
Reason: X-rays are of very short wavelengths and possess electromagnetic character.
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

241. The energy of separation of an electron in a Hydrogen like atom in excited state is 3.4 eV The de-Broglie wave length (in Å) associated with the electron is:
a) 3.33 b) 6.66 c) 13.31 d) 16.65

242. The quantum numbers of four electrons (e_1 to e_4) are given below

	n	l	m	s
e_1	3	0	0	$\pm$1/2
e_2	4	0	0	1/2
e_3	3	2	2	-1/2
e_4	3	1	-1	1/2

The correct order of decreasing energy of these electrons is:
a) $e_4 > e_3 > e_2 > e_1$ b) $e_2 > e_3 > e_4 > e_1$ c) $e_3 > e_2 > e_4 > e_1$ d) $e_1 > e_3 > e_4 > e_2$

243. No of revolutions made by the electron in one sec in 2nd orbit of Be^{3+}
a) 1.31×10^{16} b) 2.13×10^{16} c) 1.23×10^{15} d) 2.68×10^{14}

244. Be^{+3} and a proton are accelerated by the same potenatial, their de-Broglie wavelengths have the ratio (assume mass of proton = mass of neutron).
a) 1: 2 b) 1: 4 c) 1: 1 d) $1 : 3\sqrt{3}$

245. Match the values of column II with column I and mark the appropriate choice.

Column I		Column II	
(A)	Mass of electron	(i)	1.673×10^{-27} kg
(B)	Mass of proton	(ii)	-1.602×10^{-19} C
(C)	Charge of electron	(iii)	9.1×10^{-31} kg
(D)	e/m for an electron	(iv)	1.76×10^{8} C/g

a) (A) ⟶ (i), (B) ⟶ (ii), (C) ⟶ (iv), (D) ⟶ (iii) b) (A) ⟶ (iii), (B) ⟶ (i), (C) ⟶ (ii), (D) ⟶ (iv)
c) (A) ⟶ (ii), (B) ⟶ (iii), (C) ⟶ (iv), (D) ⟶ (i) d) (A) ⟶ (i), (B) ⟶ (iii), (C) ⟶ (ii), (D) ⟶ (iv)

246. Which of the following statements about the electron is incorrect?
a) It is a negatively charged particle.
b) The mass of electron is equal to the mass of neutron.
c) It is a basic constituent of all atoms. d) It is a constituent of cathode rays.

247. According to Bohr's theory, the angular momentum of an electron in 5th orbit is
a) $\frac{10h}{\pi}$ b) $\frac{25h}{\pi}$ c) $\frac{1.5h}{\pi}$ d) $2.5\frac{h}{\pi}$

248. Which of the following radiation following has highest wave number?
a) Microwaves b) X-rays c) I.R.-rays d) Radiowaves

249. In electromagnetic radiation, which of the following has greater wavelength than visible light?
a) U.V-rays b) I.R-rays c) Gamma rays d) X-rays

250. An electron is revolving in the 2nd orbit of He^+ ion. To this if 12.1 eV of energy supplied. Then to which orbit it will be excited.
a) 6 b) 8 c) 4 d) 2

251. What is the maximum number of emission lines obtained when the excited electron of a H atom in n = 5 drops to the ground state?
a) 12 b) 15 c) 21 d) 10

252. One microgram of radioactive sodium $_{11}Na^{24}$ with a half-life of 15 h was injected into a living system for a bio assay. How long will it take for the radioactivity to fall to 25% of the initial value?
a) 60 h b) 22.5 h c) 375 h d) 30 h

253. The number of nodes possible in radial probability distribution curve of 3d orbital is
a) 1 b) 2 c) 3 d) 0

254. The de Broglie wavelength associated with a ball of mass 200 g and moving at a speed of 5 metres/hour, is of the order of (h = 6.625 x 10^{-34} Js) is:
a) 10^{-15} m b) 10^{-20} m c) 10^{-25} m d) 10^{-30} m

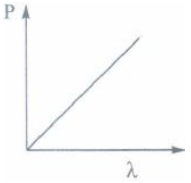
255. What will be the uncertainty in velocity of an electron when the uncertainty in its position is 1000 Å?
a) 5.79 x 10^{2} ms^{-1} b) 5.79 x 10^{8} ms^{-1} c) 5.79 x 10^{4} ms^{-1} d) 5.79 x 10^{-10} ms^{-1}

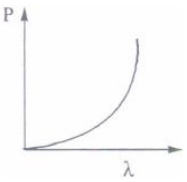
256. The spectrum of white light ranging from red to violet is called a continuous spectrum because
a) different colours are seen as different bands in the spectrum
b) the colours continuously absorb energy to form a spectrum
c) the violet colour merges into blue, blue into green, green into yellow and so on
d) it is a continuous band of coloured and white light separating them

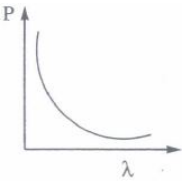
257. What is the maximum numbers of electron that can be associated with the following set of quantum numbers? n = 3, l = 1, m_1 = -l
a) 6 b) 4 c) 2 d) 10

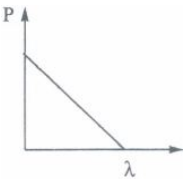
258. Atomic number of element in 4th period and 5th column will be
a) 89 b) 71 c) 73 d) 75

259. Which of the sequences given below shows the correct increasing order of energy?
a) 3s, 3p, 4s, 4p, 3d, 5s, 5p, 4d b) 3s, 3p, 3d, 4s, 4p, 4d, 5s, 5p
c) 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p d) 3s, 3p, 4s, 4p, 5s, 3d, 4d, 5p

260. The graph between momentum p and de-Broglie wavelength λ of photon is
a) 

b) 

c) 

d) 

261. The radius of the stationary state which is also called Bohr radius is given by the expression $r_n = n^2a_o$ where the value of a_o is
a) 52.9 pm b) 5.29 pm c) 529 pm d) 0.529 pm

262. Number of angular nodes for 4d orbital is _____
a) 4 b) 3 c) 2 d) 1

263. What is the ratio of time periods(T_1/T_2) in second orbit of H atom to 3rd orbit of He^+
a) 8/27 b) 32/27 c) 27/32 d) 27/8

264. What will the ratio of the wavelength of the first line to that of second line of Paschen series of H atom?
a) 256 : 175 b) 175 : 256 c) 15 : 16 d) 16 : 15

265. Which of the following sets of quantum numbers describes the electron which is removed most easily from a potassium atom in its ground state?

a) n = 3, l = 1, m_1 = 1, ms = $-\frac{1}{2}$ b) n = 2, l= 1 m_1 = 0, m_s = $-\frac{1}{2}$

c) n = 4, l=0,m_1 = 1,m_s= $+\frac{1}{2}$ d) n = 4 , 1=0,m_1 = 0,m_s = $+\frac{1}{2}$

266. Electrons never pair, if there are empty orbitals in a given sub-shell. This is:

a) Aufbau principle b) Pauli's exclusion principle c) Hund's rule of maximum multiplicity d) Heisenberg's uncertainity principle

267. Which of the following has highest value of magnetic moment?

a) Fe^{2+} b) Mn^{+2} c) Cr^{+3} d) V^{+3}

268. No two electrons in an orbital can have parallel spin. This statement emerges from:

a) Hund's rule b) Aufbau principle c) Pauli's exclusion principle d) (n + 1) rule

269. If the value of principal quantum number is 3, the total possible values for magnetic quantum number will be

a) 5 b) 9 c) 8 d) 10

270. Two electrons occupying the same orbital are distinguished by :

a) azimuthal quantum number b) spin quantum number c) principal quantum number d) magnetic quantum number

271. If the Planck's constant h = 6.6 x 10^{-34} Js, the dc-Broglies wave length ofa particle having momentum of 3.3 x 10^{-24} $kg.ms^{-1}$ will be:

a) 2 x 10^{-10} m b) 1 x 10^{-15} m c) 10^{-5} m d) 4 x 10^{-10} m

272. The frequency of the matter wave of a particle is given by

a) $\frac{2K.E}{h}$ b) $\frac{K.E}{2h}$ c) $\frac{h}{2K.E}$ d) $\frac{K.E}{h}$

273. An electron is in one of the 3d-orbitals. What are the possible values of n, l and m for this electron?

a) n = 3, l = 0, m_1 = 0 b) n=3, l=1, m_1=-1,0,+1 c) n=3, l=2, m_1=-2,-1,0,+1,+2 d) n=4, l=0, 1, m_1=-1,0,+1

274. For an e^- in a hydrogen atom, the wave function Ψ.If is proportional to $e^{-(r/a_0)}$ where a_0 as Bohrs radius; what is the ratio of probability of finding the e^- at the nucleus to the probability of finding it at a_0 the wave function is $\Psi = \frac{1}{\sqrt{\pi}}\left(\frac{1}{a_0}\right)^{3/2}$ $e^{-(r/a_0)}$

a) e b) e^2 c) $1/e^2$ d) Zero

275. The orbital diagram in which both the Pauli's cxclusing principle and Hund's rule are violated, is:

a)  b)  c) 

d) 

276. For a particular value of azimuthal quantum number (l), the total number of magnetic quantum number values (m) is given by

a) $l = \frac{m+1}{2}$ b) $l = \frac{m-1}{2}$ c) $l = \frac{2m+1}{2}$ d) $n = \frac{2l+1}{2}$

277. A certain metal when irradiated by light (v = 3.2 x 10^{16} Hz) emits photoelectrons with twice of K.E. as did photoelectrons when the same metal is irradiated by light (v = 2.0 x 10^{16} Hz). The Vo of the metal is
a) 1.2 x 10^{14} Hz b) 8 x 10^{15} Hz c) 1.2 X 10^{16} Hz d) 4 x 10^{12} Hz

278. If uncertainty in measurement of position and momentum are equal calculate the uncertainty in velocity
a) $\frac{\Delta p}{m}$ b) $\frac{m}{\Delta p}$ c) mΔp d) $\frac{1}{m\Delta p}$

279. The kinetic energy of the electron is:
a) 3.4 eV b) 5.1 eV c) 13.6 eV d) 10.2 eV

280. Which of the following options does not represent ground state electronic configuration of an atom?
a) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^8\ 4s^2$ b) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^9\ 4s^2$
c) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^1$ d) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p6\ 3d^5\ 4s^1$

281. Assertion: According to de Broglie, the wavelengths associated with electrons and other subatomic particles can be detected experimentally.
Reason: The wavelength associated with any material particle is directly proportional to its mass.
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

282. What is the maximum number of orbitals that can be identified with the following quantum numbers?
n = 3, l = +1, m_1 = 0
a) 1 b) 2 c) 3 d) 4

283. The spectrum of helium is expected to be similar to that of:
a) H b) Na c) Li^+ d) He^+

284. Consider following statements
i) Splitting of spectral line occurs when placed in a magnetic field or in an electric field
ii) In case of 1s-orbital. the density of the charge cloud is the greatest at the nucleus and falls off with the distance. The density (at a particular distance) is uniform
iii) Electron-density is concentrated along a particular direction in case of 2-orbital.
iv) A p-orbital can take maximum of six electrons.
Select the correct option
a) i, ii, iv b) i, ii, iii c) ii, iii, iv d) i, iii, iv

285. The Bohr's energy of a stationary state of hydrogen atom is given as $E_n = \frac{-2\pi me^4}{n^2h^2}$. Putting the values of m and e for n^{th} energy level which is not the correct value?
a) $E_n = \frac{-21.8\times10^{-19}}{n^2}$ J atom^{-1} b) $E_n = \frac{-13.6}{n^2}$ eV atom^{-1} c) $E_n = \frac{-1312}{n^2}$ kJ mol^{-1}
d) $E_n = \frac{-12.8\times10^{-19}}{n^2} erg^{-1}\ atom^{-1}$

286. What is the lowest value of n that allows g orbital to exist?
a) 6 b) 7 c) 4 d) 5

287. The radius of first Bohr's orbit for hydrogen is 0.53A°. The radius of third Bohr's orbit would be
a) 0.79A° b) 1.59A° c) 3.18A° d) 4.77A°

288. The velocity of an e^- in excited state of H-atom is 1.093 x 10^6 m/s. What is the circumference of this orbit?
a) 3.32 x 10^{-10}m b) 6.64 x 10^{-10}m c) 13.30 x 10^{-10}m d) 13.28 x 10^{-8}m

289. The radioactive isotope $^{60}_{27}\mathrm{Co}$ which is used in treatment of cancer can be made (n, p) reaction. For this reaction the target nucleus is
a) $^{59}_{28}\mathrm{Ni}$ b) $^{59}_{27}\mathrm{Co}$ c) $^{60}_{28}\mathrm{Ni}$ d) $^{60}_{27}\mathrm{Co}$

290. The uncertainty in momentum of an electron is 1 x 10^{-5} kg/ms. The uncertainty in its position will be (Given. h = 6.62 x 10^{-34} kg m^2/s).
a) 1.05 x 10^{-28} m b) 1.05 x 10^{-26} m c) 5.27 x 10^{-30} m d) 5.25 x 10^{-28} m

291. In a given atom no two electrons can have the same values of all the four quantum numbers. This is called:
a) Hund's rule b) Aufbau principlc c) Uncertainty principle d) Pauli's exclusion principle

292. Electronic configuration of calcium atom can be written as :
a) [Ne]$4p^2$ b) [Ar]$4s^2$ c) [Ne]$4s^2$ d) [Kr]$4p^2$

293. The value of e/m for an element is
a) 1.78x10^8 c/g b) 1.6724x10^{-24} c/g c) 0.005486 c/g d) 1.00866 c/g

294. The wavelength of an electron moving with velocity of 10^7 ms^{-1} is:
a) 7.27 x 10^{-11} m b) 3.55 x 10^{-11} m c) 8.25 x 10^{-4} m d) 1.05 x 10^{-16} m

295. The ionization potential of He^+ in ground state is
a) 2427 kJ mol^{-1} b) 5249 kJ mol^{-1} c) 7116 kJ mol^{-1} d) 9811 kJ mol^{-1}

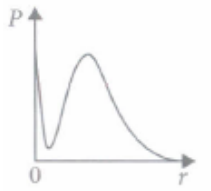
296. In the radial probability distribution curve for the 2s orbital of the hydrogen atom, the minor maximum, the node and the major maximum occur at the following distances from the nucleus respectively
a) 1.1A°,0.53A°,2.6A ° b) 0.53A°, 1.1A°,2.6A° c) 2.6A°,1.1A° ,0.53A°
d) 0.53A°,2.116A°,2.6A°

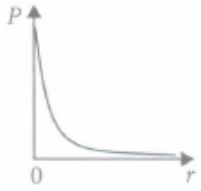
297. According to law of photochemical equivalence the energy absorbed (in ergs/mole) is given as (h = 6.62 x 10^{-27} ergs, $C = 3 \times 10^{10}\ \mathrm{cm\ s^{-1}}) \mathrm{N_A} = 6.02 \times 10^{23}\ \mathrm{mol^{-1}}$
a) $\frac{1.196\times10^{16}}{\lambda}$ b) $\frac{1.196\times10^{8}}{\lambda}$ c) $\frac{2.859\times10^{5}}{\lambda}$ d) $\frac{2.859\times10^{16}}{\lambda}$

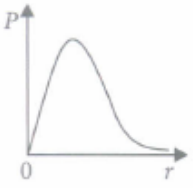
298. If $^a_b\mathrm{X}$ emits firstly a positron, then two α and two β in the last α is emitted and finally it converts to $^c_d\mathrm{Y}$. The correct relation is
a) a = c + 12, d = b - 5 b) a = c + 8, d = b - 1 c) a = c + c6, d = b - 2
d) a = c + 4, d = b - 2

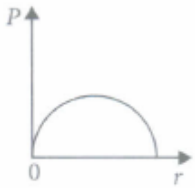
299. The potential energy of electron in the ground state of He^+ ion is
a) 4.358 x 10^{-18} J/atom b) -7.112 x 10^{-18} J/atom c) -1.743 x 10^{-17} J/atom
d) -8.279 x 10^{-18} J/atorn

300. P is the probability of finding the Is electron of hydrogen atom in a spherical shell of infinitesimal thickness dr, at a distance r from the nucleus. The volume of this shell is $4\pi r^2$ dr? The qualitative sketch of the dependence of P on r is

a) 

b) 

c) 

d) 

301. A body of mass 10 g is moving with a velocity of 100 ms^{-1}. The wavelength associated with it is
a) 6.626 x 10^{-7} m b) 6.626 x 10^{-34}m c) 6.626 x 10^{-4} m d) 6.626 x 10^{-35} m

302. Consider the ground state of Cr atom (Z = 24). The numbers of electrons with azimuthal quantum numbers, ℓ =1 and 2, are respectively:
a) 12, 4 b) 12, 5 c) 16, 4 d) 16, 5

303. The uncertainty in momentum of an electron is 1 x 10^{-5} kg.m/s.The uncertainity in its position will be (h = 6.63 x 10^{-34} Js)
a) 1.05 x 10^{-28} m b) l.05 x 10^{-26} m c) 5.28 x 10^{-30} m d) 5.27 x 10^{-28} m

304. Assertion: The maximum number of electrons in the shell with principal quantum number n is equal to $2n^2$.
Reason: Two electrons can have the same value of three quantum numbers n, l and m, but must have the opposite spin quantum number.
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

305. There is no difference between a 2p and 3p orbitals regarding:
a) Value of n b) Size c) Energy d) Shape

306. Which of the following statements do not form a part of Bohr's model of hydrogen atom?
a) Energy of the electrons in the orbits are quantised.
b) The electron in the orbit nearest to the nucleus has the lowest energy.
c) Electrons revolve in different orbits around the nucleus.
d) The position and velocity of electrons in the orbit cannot be determined simultaneously.

307. If an isotope of hydrogen has two neutrons in its atom, its atomic number and atomic mass respectively be
a) 2 and 1 b) 1 and 1 c) 3 and 1 d) 1 and 3

308. An ion with mass number 56 contains 3 units of positive charge and 30.4% more neutrons than electrons. What would be the symbol of this ion?
a) ${}^{56}_{26}Fe^{3+}$ b) ${}^{56}_{26}Fe^{2+}$ c) ${}^{56}_{27}Co^{2+}$ d) ${}^{58}_{27}Co^{3+}$

309. Which of the following are true for cathode rays?
a) It travels along a straight line b) It emits X-rays when strikes a metal
c) It is an electromagnetic wave d) It is not deflected by magnetic field

310. Assertion: In hydrogen and hydrogen like species, orbital energy depends only on the quantum number n whereas in multi-electron atoms it depends on quantum numbers n and l.
Reason: The principal quantum number determines the size and the energy of the orbital.

a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

311. How many electrons can fit in the orbital for which n = 3 and 1= 1?
a) 2 b) 6 c) 10 d) 14

312. What will be the orbital angular momentum of an electron in 2s-orbital?
a) Zero b) One c) Two d) Three

313. What is the K.E. of photo electrons.
a) 6.23×10^{-20} J b) 6.25×10^{-22} J c) 6.625×10^{-18} J d) 6.625×10^{-19} J

314. Sodium ion is isoelectronic with the atom
a) Mg^{2+} b) Al^{3+} c) Ne d) N^{3-}

315. Assertion: When an iron rod is heated in a furnace, the radiation emitted goes from a lower frequency to a higher frequency as the temperature increases.
Reason: The energy of a quantum of radiation is proportional to its frequency.
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

316. The ratio of wavelength for II line of Balmer series and I line of Lyman series is
a) 1 b) 2 c) 3 d) 4

317. The configuration $1s^2\ 2S^2\ 2p^5\ 3s^1$ shows
a) Ground state of fluorine b) Excited state of fluorine c) Exited state of neon atom
d) Excited state of argon

318. The wavelength of the first member of the Balmer series in hydrogen spectrum is x A° Then the wavelength(in A°) of the first member of Lyman series in the same spectrum is
a) $\frac{5}{27}$x b) $\frac{4}{3}x$ c) $\frac{27}{5}$x d) $\frac{5}{36}$x

319. Assertion: In Rutherford's α-particle scattering experiment, most of the α-particles were deflected by nearly 180^0.
Reason: The positive charge of the atom is spread throughout the atom that repelled and deflected the positively charged α-particles.
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

320. Splitting of spectral lines under the influence of magnetic field is called
a) Stark effect b) Zeeman effect c) photoelectric effect d) screening effect

321. Which of the following properties of atom could be explained correctly by Thomson model of atom?
a) Overall neutrality of atom b) Spectra of hydrogen atom
c) Position of electrons, protons and neutrons in atom d) Stability of atom

322. Ionisation energy of He^+ is 19.6×10^{-18} J $atom^{-1}$. The energy of the first stationary state (n = 1) of Li^{2+} is
a) -4.41×10^{-18} J.$atom^{-1}$ b) -4.41×10^{-17} J.$atom^{-1}$ c) -4.41×10^{-16} J.$atom^{-1}$
d) -8.72×10^{-18} J.$atom^{-1}$

323. The electronic configuration of gadolinium (Atomic number 64) is
a) [Xe]$4f^8$, $5d^9$, $6s^2$ b) [Xe]$4f^7$, $5d^1$, $6s^2$ c) [Xe)$4f^6$, $5d^2$, $6s^2$ d) [Xe)$4f^3$, $5d^5$, $6s^2$

324. Which of the following is not permissible arrangement of electrons in an atom?
a) $n = 5, l = 3, m = 0, s = +1/2$ b) $n = 3, l = 2, m = -3, s = -1/2$
c) $n = 3, l = 2, m = -2, s = -1/2$ d) $n = 4, l = 0, m = 0, s = +1/2$

325. The nucleus of tritium consists of
a) 1 proton+1 neutron b) 1 proton+3 neutrons c) 1 proton+zero neutrons
d) 1 proton+2 neutrons

326. Which statement about energy level in H-atom is correct?
a) Only n and l decide energy level b) Only l decides energy level
c) Only n decides energy level d) n, l and m decide energy level

327. Half-life for radioactive ^{14}C is 5760 yr. In how many years, 200 mg of ^{14}C will be reduced to 25 mg?
a) 5760 yr b) 11520 yr c) 17280 yr d) 23040 yr

328. The number of elements in the third period of the periodic table is:
a) 2 b) 8 c) 18 d) 32

329. The energy of an electron in the first Bohr's orbit ofa hydrogen atom is 2.18 x 10^{-18}J. Its energy in the second orbit would be
a) -1.09 x 10^{-18} J b) -4.36 x 10^{-18} J c) -5.45 x 10^{-19} J d) -8.72 x 10^{-18} J

330. Which quantum number defines the orientation of orbital in the space around the nucleus ?
a) Principal quantum number (n) b) Angular momentum quantum number
c) Magnetic quantum number (m_1) d) Spin quantum number (m_s)

331. What is the electronic configuration of O^{2-} ion?
a) $1s^2\ 2s^2\ 2p^6$ b) $1s^2\ 2s^2\ 2p^4$ c) $1s^2\ 2s^2\ 2p^5$ d) $1s^2\ 2s^2\ 2p^3$

332. The angular momentum of electron in 'd' orbital is equal to:
a) $2\sqrt{3}\hbar$ b) $\hbar$ c) $\sqrt{6}\hbar$ d) $\sqrt{2}\hbar$

333. The order of filling of electrons in the orbitals of an atom will be
a) 3d, 4s, 4p, 4d, 5s b) 4s, 3d, 4P, 5s, 4d c) 5s, 4p, 3d, 4d, 5s d) 3d, 4P, 4s, 4d, 5s

334. If the wavelength of the electron is numerically equal to the distance travelled by it in one second, then
a) $\lambda = \sqrt{\frac{h}{m}}$ b) $\lambda = \frac{h}{p^2}$ c) $\lambda = \frac{h}{m}$ d) $\lambda = \sqrt{\frac{h}{p}}$

335. Difference between incident frequency and threshold frequency is
a) 9.4 x 10^{13} Hz b) 8.5 x 10^{12} Hz c) 9.4 x 10^{12} Hz d) 8.4 x 10^{10} Hz

336. The electrons identified by quantum numbers n and 1 can be placed in the order of increasing energy as:
1. n = 4, l = 1
2. n = 4, l = 0
3. n = 3, l = 2
4. n = 3, l = 1
a) 3 > 4 < 2 < 1 b) 4 < 2 < 3 < 1 c) 2 < 4 < 1 ≤ 3 d) 1 < 3 ≤ 2 < 4

337. Which of the following is isoelectroic?
a) CO_2, NO_2 b) NO_3^-, CO_3^{2-} c) CN, CO d) SO_2, CO_2

338. Time taken for an electron to complete one revolution in Bohr orbit of hydrogen atom is
a) $\frac{4\pi^2 mr^2}{nh}$ b) $\frac{nh}{4\pi^2 mr}$ c) $\frac{2\pi mr}{n^2h^2}$ d) $\frac{h}{2\pi mr}$

339. Which of the following has maximum unpaired d-electrons?
a) Zn^+ b) Fe^{2+} c) Ni^{3+} d) Cu^+

340. An orbital is described with the help of a wave function. Since many wave functions are possible for an electron, there are many atomic orbitals. When atom is placed in a magnetic field the possible number of orientations for an orbital of azimuthal quantum number 3 is:
a) three b) two c) five d) seven

341. The ratio of charge to mass of an electron in coulombs per gram was determined by J.J. Thomson. He determined this ratio by measuring the deflection of cathode rays in electric and magnetic fields. What value did he find for this ratio?
a) -1.76 x 10^8 coulombs/g b) 1.76 x 10^{-8} coulombs/g c) -1.76 x 10^{10} coulombs/g
d) -1.76 x 10^{-10} coulombs/g

342. The value of X-intercept:
a) 9 x 10^4 Hz b) 10.2 x 10^5 Hz c) 8.6 x 10^5 Hz d) 9 x 10^{14} Hz

343. If radiation correcsponding to second line of "Balmer series" of Li^{2+} ion, knocked out electron from first excited state of H-atom, then kinetic energy of ejected electron would be:
a) 2.55 eV b) 4.25 eV c) 11.25 eV d) 19.55 eV

344. The energy of the electron in a hydrogen atom has a negative sign for all possible orbits because:
a)
when the electron is attracted by the nucleus and is present in orbit n, the energy is emitted and its energy is lowered.
b)
when the electron is attracted by the nucleus and is present in orbit n, the energy is absorbed and its energy is increased.
c)
when the electron is repelled by the nucleus, the energy is released and its energy is lowered.
d) none of these.

345. The half-life of a substance in a certain enzyme -catalyzed reaction is 138 s. The time required for the concentration of the substance to fall from 1.28 $1.28\mathrm{mgL}^{-1}$ to $0.04\mathrm{mgL}^{-1}$ is:
a) 414 s b) 552 s c) 690 s d) 276 s

346. The number of nodes for 4f orbital is:
a) 0 b) 1 c) 2 d) 3

347. Which of the following relates a photon, both as a wave and as a stream or particles?
a) $E = mc^2$ b) Photoelectric effect c) Diffraction d) $E = h\upsilon$

348. Ground state electronic configuration of nitrogen atom can be represented by:

a)  b)  c) 
d) 

349. The velocity of an electron in a certain Bohr orbit of H-atom bears the ratio 1:275 to the velocity of light. The quantum number (n) of the orbit is
a) 3 b) 2 c) 1 d) 4

350. The energy difference between the ground state of an atom and its excited state is 3×10^{-19} J. What is the wavelength of the photon required for this transition?
a) 6.6×10^{-34} m b) 3×10^{-8} m c) 1.8×10^{-7} m d) 6.6×10^{-7} m

351. Which of the following is not an electromagnetic radiation?
a) X-rays b) Gamma-rays c) Infrared -rays d) Cathode -rays

352. The electronic configuration of sodium is
a) $[Ne]3s^2$ b) $[Ne]3s^1$ c) $[Ar]4s^1$ d) $[Ar]4s^2$

353. The atomic number of an element 'M' is 26. How many electrons are present in the M-shell of the element in its M^{3+} state?
a) 11 b) 15 c) 14 d) 13

354. Consider the ground state of Cr atom (Z = 24). The numbers of electrons with the azimuthal quantum numbers, l = 1 and 2 are, respectively
a) 12 and 4 b) 16 and 5 c) 16 and 4 d) 12 and 5

355. The number of nodes and nodal planes in 4p orbital are respectively
a) 2,1 b) 1,2 c) 2,3 d) 3,2

356. Describe the orbital with following quantum numbers:
(i) n=3, l=2
(ii) n=4,l=3
a) (i) 3p, (ii) 4f b) (i) 3d, (ii) 4d c) (i) 3f, (ii) 4f d) (i) 3d, (ii) 4f

357. The probability of finding out an electron at a point within an atom is proportional to the
a) square of the orbital wave function i.e., Ψ^2 b) orbital wave function i.e., Ψ
c) Hamiltonian operator i.e., H d) principal quantum number i.e., n

358. The energy of a I,II and III energy levels of a certain atom are E, $\frac{4E}{3}$ and 2E respectively A photon of wavelength λ is emitted during a transition from III to I. What will be the wavelength of emission for transition II to I?
a) $\frac{\lambda}{2}$ b) λ c) 2λ d) 3λ

359. Which of the following sets of quantum numbers is correct for an electron in 4f orbital?
a) n = 4, l= 3, m = + 4, s = +1/2 b) n = 3, l= 2, m = -2, s = +1/2
c) n = 4, l= 3, m = + 1, s = + 1/2 d) n = 4, l= 0, m_l = 0, m_s = + 1/2

360. The value of Planck's constant is 6.63×10^{34} Js. The speed of light is 3×10^{17} nm s^1. Which value is closest to the wavelength in nanometer of a quantum of light with frequency of 6×10^{15} s^1?
a) 25 b) 50 c) 75 d) 10

361. The maximum number of electrons that can be present in an orbital with s = +1/2 and l = 2
a) 1 b) 2 c) 5 d) 7

362. The hydrogen-like species Li^{2+} is in a spherically symmetric state S_1 with one radial node. Upon absorbing light the ion undergoes transition to a state S_2 The state S_2 has one radial node and its energy is equal to the ground state energy of the hydrogen atom. Energy of the state s_1 in units of the hydrogen atom ground state energy is
a) 0.75 b) 1.50 c) 2.25 d) 4.50

363. The increasing order of e/m values for electron, proton, neutron and alpha particle is
a) e, p, n, α b) n, p, e, α c) n. p, α, e d) n, α, p, e

364. What will be the energy of a photon which corresponds to the wavelength of 0.50 Å?
a) 3.98×10^{-15}J b) 3×10^{15} J c) 3.9×10^{8} J d) 3×10^{-34}J

365. Which of the following configurations represents the most electronegative element?
a) $1s^2\ 2s^2\ 2p^6\ 3s^1$ b) $1s^2\ 2s^2\ 2p^5$ c) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$ d) $1s^2\ 2s^2\ 2p^4$

366. The half-life of ${}_6C^{14}$, $\left(\lambda = 2.31 \times 10^{-4} \text{ per year}\right)$ is
a) $2 \times 10^2 \text{yr}$ b) $3 \times 10^3 \text{yr}$ c) $3.3 \times 10^4 \text{yr}$ d) $4 \times 10^3 \text{yr}$

367. Mark the incorrect statement regarding the photoelectric effect.
a)
There is no time lag between the striking of light beam and the ejection of electrons from the metal surface
b) The number of electrons ejected is inversely proportional to the intensity of light
c) Photoelectric effect is not observed below threshold frequency
d) The kinetic energy of the electrons increases with increase in frequency of light used

368. Which is the correct order of increasing energy of the listed orbitals in the atom of titanium? (Atomic Number Z = 22)
a) 4s 3s 3p 3d b) 3s 3p 3d 4s c) 3s 3p 4s 3d d) 3s 4s 3p 3d

369. Total number of orbitals associated with third shell will be _____ .
a) 2 b) 4 c) 9 d) 3

370. If an ion of ${}_{25}Mn$ has a magnetic of 3.873 B.M. Then Mn is in which state.
a) + 2 b) + 3 c) + 4 d) + 5

371. How many orbitals in total are associated with 4^{th} energy level?
a) 4 b) 9 c) 16 d) 7

372. Three elements 'X, 'Y' and 'Z' have atomic numbers 18, 19 and 20 respectively. How many electrons are present in the M shells of these elements?
a) 8,9,10 b) 8,10,13 c) 8,8,8 d) 8,9, 12

373. A 100 watt bulb emits monochromatic light of wavelength 400 nm. Calculate the number of photons emitted per second by the bulb.
a) $3 \times 10^{20}\ s^{-1}$ b) $2 \times 10^{-20}\ s^{-1}$ c) $2 \times 10^{20}\ s^{-1}$ d) $1 \times 10^{-20}\ s^{-1}$

374. Energy of an electron in n^{th} Bohr orbit is given as
a) $-\dfrac{n^2h^2}{4\pi^2mZe^2}$ b) $-\dfrac{2\pi^2Z^2me^4}{n^2h^2}$ c) $-\dfrac{2\pi Ze^2}{nh}$ d) $-\dfrac{n^2h^2}{2\pi^2Z^2me^4}$

375. Number of unpaired electrons in N^{2+} is/are
a) 2 b) 0 c) 1 d) 3

376. Who modified Bohr's theory by introducing elliptical orbits for electron path?

a) Hund b) Thomson c) Rutherford d) Sommerfeld

377. The quantum number which is equal for all the d-electrons in an atom is
a) 1 b) m c) s d) n

378. A hydrogen atom in the ground state is excited by monochromatic ratiation of wavelength $\lambda\ \mathring{A}$. The resulting spectrum consists of maximum 15 different lines. What is the wavelength λ ?
a) 937.3$\mathring{A}$ b) 1025$\mathring{A}$ c) 1236$\mathring{A}$ d) 1120$\mathring{A}$

379. A proton and an electron are accelerated by the same potential difference. If λ_e and λ_p denote the De-broglie wavelength of electron and proton then
a) $\lambda_e=\lambda_p$ b) $\lambda_e<\lambda_p$ c) $\lambda_e>\lambda_p$ d) No releation between λ_e and λ_p

380. The spin-only magnetic moment of free ion is $\sqrt{8}$ B.M. The spin angular momentum of electron will be
a) $\sqrt{2}\frac{h}{2\pi}$ b) $\sqrt{8}\frac{h}{2\pi}$ c) $\sqrt{6}\frac{h}{2\pi}$ d) $\sqrt{\frac{3}{4}}\frac{h}{2\pi}$

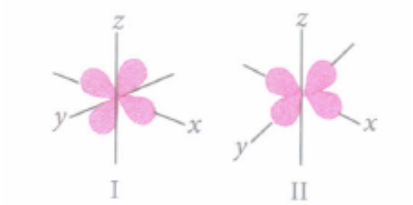
381. Carbon- 14 dating method is based on the fact that
a) carbon-14 fraction is same in all objects b) carbon-14 is highly insoluble
c) ratio of carbon-14 and carbon-12 is constant d) All of the above

382. Maximum number of electrons in a subshell of an atom is determined by the following:
a) 2l + 1 b) 4l - 2 c) $2n^2$ d) 4l + 2

383. The electron was originally in
a) n = 3 b) n = 4 c) n = 5 d) n = 2

384. The d-orbital with out two nodal surfaces formed one is:
a) $3d_{x^2-y^2}$ b) $3d_{x^2}$ c) $3d_{xy}$ d) $4d_{xy}$

385. Observe the given boundary surface diagrams of two orbitals I and II and choose the correct option.



a) I-$d_{x^2-y^2}$, II-d_{yz} b) I-d_{yz}, II-$d_{x^2-y^2}$ c) I-d_{xz}, II-d_{z^2} d) I-d_{xy}, II-dxz

386. A particle X moving with a certain velocity has a debroglie wave length of $1A^0$. If particle Y has a mass of 25% that of X and velocity 75% that of X, debroglies wave length of Y will be:
a) 3 A^0 b) 5.33 A^0 c) 6.88 A^0 d) 48 A^0

387. The region where probability density function reduces to zero is called
a) probability density region b) nodal surfaces c) orientation surfaces d) wave function

388. Which of the following quantum numbers are correct for the outermost electron of sodium atom?
a) n = 4, 1 = 0, m = 0, s = +1/2 b) n = 3, l = 0, m = 0, s = -1/2 c) n=3, l= 1, m=+1, s=+1/2
d) n=3, l=2, m=-l, s=-1/2

389. An element with mass number 81 contains 31.7% more neutrons as compared to protons. Assign the atomic symbol.

a) ${}^{81}_{34}Br$ b) ${}^{81}_{35}Br$ c) ${}^{81}_{36}Sr$ d) ${}^{81}_{37}Sr$

390. The orbitals are called degenerate when:
a) they have the same wave functions
b) they have the same wave functions but different energies
c) they have different wave functions but same energy d) they have the same energy

391. What will be the value of modified Rydberg's constant, if the nucleus having mass m_N and the electron having mass m_e revolve around the centrer of the mass?
a) $R_H \times \frac{m_N}{m_e}$ b) $R_H \times \frac{m_e}{m_N}$ c) $R_H \times \frac{m_e}{m_N + m_e}$ d) $R_H \times \frac{m_N}{m_N + m_e}$

392. The longest wavelength doublet absorption transition is observed at 589 and 589.6 nm. Energy difference between two excited states is :
a) 3.31 x 10^{-22} kJ b) 3.31 x 10^{-22} J c) 2.98 x 10^{-21} J d) 3.0 x 10^{-21} kJ

393. How many subshells and electrons are associated with n = 4?
a) 32, 64 b) 16, 32 c) 4, 16 d) 8, 16

394. Match the column I with column II and mark the appropriate choice.

Column I		Column II	
(A)	Uncertainty of an object	(i)	$\frac{5.29 \times n^2}{Z}$
(B)	Bohr's radius of an orbit	(ii)	$\frac{h}{4\pi m}$
(C)	Angular momentum of an electron	(iii)	$\frac{h}{mv}$
(D)	de Broglie wavelength	(iv)	$n.\frac{h}{2\pi}$

a) (A) ⟶ (iii), (B) ⟶ (iv), (C) ⟶ (i), (D) ⟶ (ii) b) (A) ⟶ (ii), (B) ⟶ (i), (C) ⟶ (iv), (D) ⟶ (iii)
c) (A) ⟶ (iv), (B) ⟶ (iii), (C) ⟶ (i), (D) ⟶ (ii) d) (A) ⟶ (i), (B) ⟶ (ii), (C) ⟶ (iv), (D) ⟶ (iii)

395. For the electrons of oxygen atom, which of the following statements is correct?
a) Z_{eff} for an electron in a 2s orbital is the same as Z_{eff} for an electron in a 2p orbital
b) An electron in the 2s orbital has the same energy as an electron in the 2p orbital
c) Z_{eff} for an electron in Is orbital is the same as Z_{eff} for an electron in a 2s orbital
d)
The two electrons present in the 2s orbital have spin quantum numbers, m_s but of opposite sign

396. Chlorine exists in two isotopic forms, Cl-37 and Cl-35 but its atomic mass is 35.5. This indicates the ratio of Cl-37 and Cl-35 is approximately
a) 1:2 b) 1:1 c) 1:3 d) 3:1

397. The ratio of magnetic moments of Fe (III) and Co (II) is
a) $\sqrt{7} : \sqrt{3}$ b) $\sqrt{35} : \sqrt{15}$ c) 7:3 d) $\sqrt{24} : \sqrt{15}$

398. Though the five d-orbitals are degenerate, the first four d-orbitals are similar to each other in shape whereas the fifth d-orbital is different from others. What is the name of the fifth orbital?
a) $d_{x^2-y^2}$ b) d_z^2 c) d_{xz} d) d_{xy}

399. An element has 13 electrons in its M shell and 1 electron in N shell in ground state. Identify the element.
a) Copper b) Chromium c) Iron d) Manganese

400. The mass of a praticle is 10^{-10}g and its radius is 2x10^{-4} cm. If its velocity is 10^{-6} cm sec^{-1} with 0.0001% uncertainity in measurement. the uncertainty in its position is:

a) 5.2 x 10^{-8}m b) 5.2 x 10^{-7}m c) 5.2 x 10^{-6}m d) 5,2 x 10^{-9}m

401. The de-Broglie wavelength of an electron accelerated by an elelctric field of 'V' volts is given by:

a) $\lambda = \frac{1.23}{\sqrt{m}}$ b) $\lambda = \frac{1.23}{\sqrt{h}}m$ c) $\lambda = \frac{1.23}{\sqrt{V}}nm$ d) $\lambda = \frac{1.23}{V}$

402. Wavelength of the wave associated with a moving electron

a) Decreases with increase in speed of electron

b) Increases with increase in speed of electron

c) Remains same irrespective of speed of electron d) is zero

403. The incorrect statement regarding cathode rays is

a) They travel in straight line b) They depend on the nature of the gas

c) They are deflected by magnetic as well as electric fields

d) They produce mechanical effects

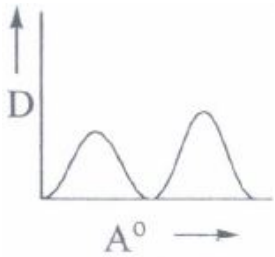
404. The energy of second Iohrorbit of the hydrogen atom is -328 kJ mol^{-1}; hence, the energy of fourth Bohr orbit would be:

a) -41 kJ mol^{-1} b) -82 kJ mol^{-1} c) -164 kJ mol^{-1} d) -1312 kJ mol^{-1}

405. Number of nodal spaces in 4s orbital is

a) 0 b) 1 c) 3 d) 4

406. The set of quantum numbers 'n' and 'l', possible for the orbital shown in the radial probability curve are



a) n=3;l=2 b) n = 4; l= 1 c) n = 2; l=0 d) n=3;l=3

407. The number of radial nodes for 3p orbital is _____

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

408. Assertion: All the isotopes of a given element show same chemical behaviour.

Reason: Isotopes have different number of neutrons present in the nucleus.

a) If both assertion and reason are true and reason is the correct explanation of assertion

b) If both assertion and reason are true but reason is not the correct explanation of assertion

c) If assertion is true but reason is false d) If both assertion and reason are false

409. Match the following.

List-I	**List-II**
a) n = 2, l= 1, m = -1	p) $2p_x$ or $2p_y$
b) n = 4, l = 2, m = 0	q) $4dz^2$
c) n=3,l=1,m=±1	r) $3P_x$ or $3p_y$
d) n = 4, l= 0, m = 0	s) 4s
e) n = 3, l= 2, m = ±2	t) $3dx^2 - y^2$ or 3dxy

a) a-q , b-r , c-p ,d-s e-t b) a-t,b-r, c-s, d-p, e-t c) a-p,b-q, c-r, d-s, e-t
d) a-s,b-t,c-r,d-s, e-p

410. The number of d-electrons in Fe^{2+} (Z = 26) is not equal to the number of electrons in which one of the following?
a) d-electrons in Fe (Z = 26) b) p-electrons in Ne (Z = 10) c) s-electrons in Mg (Z = 12)
d) p-electrons in Cl (Z = 17)

411. The uncertainities in the velocities of two particles A and B are 0.05 and 0.02m sec^{-1} respectively. The mass of B is five times to that of mass A. What is the ratio of uncertainities $\left(\frac{\Delta x_A}{\Delta x_B}\right)$ in that positions
a) 2 b) 0.25 c) 4 d) 1

412. If n and l are principle and azimuhtal quantum numbers respectively, then the expression for calculating the total number of electrons in any energy level is
a) $\sum_{l=0}^{l=n} 2(2l+1)$ b) $\sum_{l=1}^{l=n} 2(2l+1)$ c) $\sum_{l=0}^{l=n} (2l+1)$ d) $\sum_{l=0}^{l=n-1} 2(2l+1)$

413. The 3d-orbitals having electron density in all the three axes is
a) $3d_{xy}$ b) $3d_{z^2}$ c) $3d_{yz}$ d) $3d_{zx}$

414. The number of radial nodes and angular nodes for d-orbital can be represented as
a) (n - 2) radial nodes + 1 angular node = (n - 1) total nodes
b) (n - 1) radial nodes + 1 angular node = (n - 1) total nodes
c) (n - 3) radial nodes + 2 angular nodes = (n - l - 1) total nodes
d) (n - 3) radial nodes + 2 angular nodes = (n - 1) total nodes

415. Which of the following configuration is correct for iron?
a) $1s^2$, $2s^22p^6$, $3s^23p^6$ $3d^5$ b) $1s^2$,$2s^22p^6$, $3s^23p^6$, $4s^2$, $3d^5$ c) $1s^2$,$2s^22p^6$, $3s^23p^6$, $4s^2$,$3d^7$
d) $1s^2$,$2s^22p^6$, $3s^23p^6$ $3d^6$,$4s^2$

416. The wavelength of visible light is
a) 200 nm - 370 nm b) 780 nm - 890 nm c) 380 nm - 760 nm d) 900 nm - 2000 nm

417. For an electron to have the same de broglie wave length as that of a Deutron. its velocity should be times that of Deutron
a) 1836 b) 1/1836 c) 3672 d) 1/3672

418. Based on equation $\mathrm{E} = -2.178 \times 10^{-18}\left(\frac{Z^2}{n^2}\right)\mathrm{J}$ certain conclusion are written. which of them is not correct?
a) Larger the value of n, the larger is the orbit radius
b) equation can be used to calculate the change in energy when the electron changes orbit.
c)
For n = 1. tire electron has a more negative energy, than it does for n = 6 which mean that the electron is more loosely board in the smallest allowed orbit.
d)
The negative sign in equation simply means that the energy or electron bound to the nucleus is lower than it wouid be if the electron were at the infinite distance from the nucleus.

419. The radius of hydrogen atom in the ground state is 0.53 A. one radius of Li^{2+} ion (at no = 3) in a similar state is:

a) 0.17 A b) 0.53 A c) 0.265 A d) 1.06 A

420. The size of a mircorscopic particle is 1 micron and its mass is 6 x 10^{-13}g. If its position may be measured to within 0.1 % of its size, the uncertainiry in velocity (in cm^{-1}) is approximately

a) $\frac{10^{-7}}{4\pi}$ b) $\frac{10^{-5}}{4\pi}$ c) 10^{-5} d) 10^{-8}

421. How many nodal planes are there in the atomic orbitals for the principal quantum number n=3?

a) 10 b) 9 c) 11 d) 2

422. The energy absorbed by each molecule (A_2) of a substance is 4.4 x 10^{-19}J and bond energy per molecule is 4.0 x 10^{-19}J. The kinetic energy of the molecule per atom will be :

a) 2.0 x 10^{-20}J b) 2.2 x 10^{-19}J c) 2.0 x 10^{-19}J d) 4.0 x 10^{-20}J

423. Assertion: Elements like Rb, Cs, Tl, In, Ga and Sc were discovered when their minerals were analysed by spectroscopic methods.

Reason: The characteristic lines in atomic spectra can be used in chemical analysis to identify unknown atoms.

a) If both assertion and reason are true and reason is the correct explanation of assertion

b) If both assertion and reason are true but reason is not the correct explanation of assertion

c) If assertion is true but reason is false d) If both assertion and reason are false

424. For a 3s-orbital $\Psi(3s) = \frac{1}{9\sqrt{3}}\left(\frac{1}{a_0}\right)^{3/2}$ (6-6σ+σ^2)$e^{-\sigma/2}$; where $\sigma = \frac{2r.Z}{3a_0}$ what is the maximum radial distance of node from nucleus?

a) $\frac{\left(3+\sqrt{3}\right)a_0}{z}$ b) $\frac{a_0}{Z}$ c) $\frac{3}{2}\frac{\left(3+\sqrt{3}\right)a_0}{z}$ d) $\frac{2a_0}{Z}$

425. The above statement is known as :

a) de-Broglie's principle b) Pauli's exclusion principle

c) Heisenberg's Uncertainity principle d) Autbau principle

426. Which of the following conclusions could not be derived from Rutherford's a-particle scattering experiment?

a) Most of the space in the atom is empty.

b) The radius of the atom is about 10^{-10} m while that of nucleus is 10^{-15} m.

c) Electrons move in a circular path of fixed energy called orbits.

d) Electrons and the nucleus are held together by electrostatic forces of attraction.

427. The maximum number electrons in a subshell is given by the expression

a) 4l - 2 b) 4l + 2 c) 2l + 2 d) $2n^2$

428. Which of the following is not a correct statement regarding the energies of orbitals?

a) The lower the value of (n + l) for an orbital, lower is its energy

b) Electrons in the same subshell have equal energy

c) Energy of s-orbital is lower than the p-orbital and that of p-orbital is lower than the d-orbital

d)

If two orbitals have same value for (n + l), the orbital with higher value of n will have lower energy

429. The emission spectrum of He+ involves transition of electron from $n_1 \dashrightarrow n_2$ such that $n_2 + n_1 = 8$ and $n_2 - n_1 = 4$. What will be the total number of lines in the spectrum?
a) 10 b) 15 c) 20 d) 21

430. In a multi - electron atom, which of the following orbitals described by the three quantum numbers will have the same energy in the absence of magnetic and electric field
i) n = 1, l= 0, m = 0 ii) n = 2, l = 0, m = 0 iii) n = 2, l = 1, m = 1
iv) n = 3,l = 2 m = 1 v) n = 3,l = 2,m = 0
a) i and ii b) ii and iii c) iii and iv d) iv and v

431. How many neutrons are there in $^{88}_{38}Sr$?
a) 38 b) 50 c) 126 d) 88

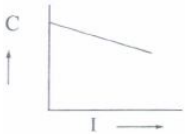
432. If uncertainty in position and momentum are equal, then uncertainty in velocity is :
a) $\frac{1}{2m}\sqrt{\frac{h}{\pi}}$ b) $\sqrt{\frac{h}{2\pi}}$ c) $\frac{1}{m}\sqrt{\frac{h}{\pi}}$ d) $\sqrt{\frac{h}{\pi}}$

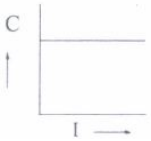
433. According to Bohr's theory, the electronic energy of H-atom in Bohr's orbit is given by
a) $E_n = -\frac{2.18\times10^{-19}\times Z}{2n^2}$ J b) $E_n = -\frac{2.179\times10^{-18}\times Z^2}{n^2}$ J c) $E_n = -\frac{21.79\times10^{-18}\times Z}{2n^2}$ J
d) $E_n = -\frac{21.8\times10^{-21}\times Z^2}{n^2}$ J

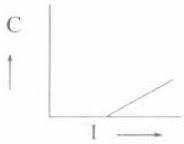
434. Consider the following pairs of ions
i) Sc^{+3} and Ti^{+4} ii) Mn^{+2} and Fe^{+2} iii) Fe^{+2} and CO^{+3} iv) Cu^{+} and Zn^{+2}
Among these pairs of ions, isoclcctronic pairs would include
a) ii, iii and iv b) i, iii and iv c) i, ii and iv d) i, ii and iii

435. For s-orbitals, since Ψ (orbital) is independent of angles, the probability (Ψ^2) is
a) also independent of angles b) spherically symmetric c) both (1) and (2) are correct
d) both (1) and (2) are incorrect

436. The graph between photo electron current (c) and intensity of photon (I)
a) 

b) 

c) 

d) 

437. Assertion: The outer electronic configurations of Cr and Cu are $3d^5 4s^1$ and $3d^{10} 4s^1$ respectively.
Reason: Electrons are filled in orbitals in order of their increasing energies given by (n + l) rule.
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

438. The work function of a metal is 4.2 eV. If radiations of $2000A^0$ fall on the metal. then the kinetic energy of the fastest photoelectron is
a) 1.6×10^{-19} J b) 16×10^{10} J c) 6.4×10^{-10} J d) 3.2×10^{-19} J

439. In a radioactive decay, an emitted electron comes from
a) the nucleus of atom b) the orbit with principal quantum number
c) the inner orbital of the atom d) the outermost orbit of the atom

440. The wave length of light having wave number 4000 cm^{-1} is
a) 2.5μm b) 250μm c) 25μm d) 25 nm

441. The electron was shown experimentally to have wave properties by :
a) de-Broglie b) N Bohr c) Davisson and Germer d) Schrodinger

442. The emission spectrum of hydrogen is found to satisfy the expression for the energy change $\Delta E = 2.18 \times 10^{-18} \left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$ J where n_1 = 1, 2, 3, ... and n_2 = 2, 3, 4. The spectral lines corresponds to Paschen series if
a) n_1 = 1 and n_2 = 2, 3, 4 b) n_1 = 3 and n_2 = 4, 5, 6 c) n_1 = 1 and n_2 = 3, 4, 5
d) n_1 = 2 and n_2 = 3,4,5

443. From the following observations predict the type of orbital :
Observation I: x y plane acts as a nodal plane
Observation 2: The angular function of the orbital intersect the three axis at origin only.
Observation 3: $R^2(r)$ v / sr curve is obtained for the orbital is

a) $5p_z$ b) $6d_{xy}$ c) 6 dx^2-y^2 d) 6 d_{yz}

444. The number of sub levels in the quantum level n = 3 is
a) 1 b) 2 c) 3 d) 4

445. The configuration of the valence orbital of an element with atomic number 22 is
a) $3d^5\ 4s^1$ b) $3d^2 4s^2$ c) $4s^1\ 4p^1$ d) $3d^2\ 4s^1\ 4p^1$

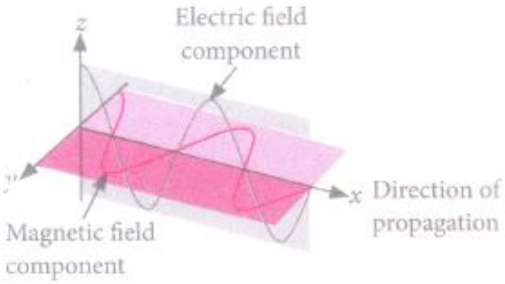
446. The ions $O^{2-}, F^-, Na^+, Mg^{2+}$ and Al^{3+} are isoelectronic. Their ionic radii show :
a) A decrease from O^{2-} to F^- and then increase from Na^+ to Al^{3+}
b) A significant increase from O^{2-} to Al^{3+} c) A significant decrease from O^{2-} to Al^{3+}
d) An increase from O^{2-} to F and then decrease from Na^+ to Al^{3+}

447. Assertion: The characteristics of cathode rays do not depend upon the material of electrodes and the nature of the gas present in the cathode ray tube.
Reason: Cathode rays consist of negatively charged particles, called electrons.
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

448. Which one is not in agreement with Bohr's model of the atom?
a) Line spectra of hydrogen atom b) Pauli's exclusion principle c) Planck's theory
d) Heisenberg's uncertainty principle

449. Assertion: For l = 2, m, can be -2, -1,0, + 1 and +2.
Reason: For a given value of l, (2l + 1) values of m_1 are possible.
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

450. Consider the figure of electromagnetic wave, and choose the correct information related to it.



a) These components have same wavelength and speed

b) They vibrate in two mutually perpendicular planes

c) Electromagnetic waves do not require medium and can move in vacuum d) All of these