EXERCISE-I (Conceptual Questions) Build Up Your Understanding

INTRODUCTION

1. Rutherford's α-particle scattering experiment proved that atom has :-
(1) Electrons (2) Neutrons (3) Nucleus (4) Orbitals

2. A and B are two elements which have same atomic weight and are having atomic number 27 and 30 respectively. If the atomic weight of A is 57 then number of neutron in B is : -
(1) 27 (2) 33 (3) 30 (4) 40

3. Find out the nucleus which are isoneutronic :-
(1) ${}^{14}_{6}C, {}^{15}_{7}N, {}^{17}_{9}F$ (2) ${}^{12}_{6}C, {}^{14}_{7}N, {}^{19}_{9}F$
(3) ${}^{14}_{6}C, {}^{14}_{7}N, {}^{17}_{9}F$ (4) ${}^{14}_{6}C, {}^{14}_{7}N, {}^{19}_{9}F$

4. Species which are isoelectronic to one another are
(a) CN^- (b) OH^- (c) CH_3^+
(d) N_2 (e) CO
Correct answer is :-
(1) a, b, c (2) a, c, d (3) a, d, e (4) b, c, d

5. For any anion X^{-3}, the mass number is 14. If anion has 10 electrons, then number of neutrons in X_2 nucleus :-
(1) 10 (2) 14 (3) 7 (4) 5

6. Which of the following pairs is correctly matched
(1) Isotopes ${}^{40}_{20}Ca, {}^{40}_{19}K$ (2) Isotones ${}^{30}_{14}Si, {}^{31}_{15}P, {}^{32}_{16}S$
(3) Isobars ${}^{16}_{8}O, {}^{17}_{8}O, {}^{18}_{8}O$ (4) Isoelectronic N^{-3}, O^{-2}, Cr^{+3}

7. The atom A, B, C have the configuration
$A \rightarrow [Z(90) + n(146)]$, $B \rightarrow [Z(92) + n(146)]$, $C \rightarrow [Z(90) + n(148)]$ so that :-
(a) A and C – Isotones (b) A and C – Isotopes
(c) A and B – Isobars (d) B and C – Isobars
(e) B and C – Isotopes
(1) a, b only (2) c, d, e only (3) a, c, d only (4) a, c, e only

8.
(i) ${}_{26}Fe^{54}$, ${}_{26}Fe^{56}$, ${}_{26}Fe^{57}$, ${}_{26}Fe^{58}$	(a) isotopes
(ii) ${}_{1}H^{3}$, ${}_{2}He^{3}$	(b) Isotones
(iii) ${}_{32}Ge^{76}$, ${}_{33}As^{77}$	(c) Isodiaphers
(iv) 92U235, ${}_{90}Th^{231}$	(d) Isobars
(v) ${}_{1}H^{1}$, ${}_{1}D^{2}$, ${}_{1}T^{3}$	

Match the above correct terms :-
(1) [(i), - a], [(ii), - d], [(iii), - b], [(iv), - c], [(v), - a]
(2) [(i), - a], [(ii), - d], [(iii), - d], [(iv), - c], [(v), - a]
(3) [(v) - a], [(iv), - c], [(iii), - d], [(ii), - b], [(i), - a]
(4) None of them

9. Choose the false statement about deuterium :-
(1) It is an isotope of hydrogen
(2) It contains $[(1e^-) + (1p^+) + (1n)]$
(3) It contains only $[(1p^+) + (1n)]$
(4) D_2O is called as heavy water

10. If the table of atomic masses is established with the oxygen atom and assigned value of 200, then the mass of carbon atom would be, approximately :-
(1) 24 (2) 150 (3) 50 (4) 112

11. The relative abundance of two rubidium isotopes of atomic weights 85 and 87 are 75% and 25% respectively. The average atomic weight of rubidium is :-
(1) 75.5 (2) 85.5 (3) 86.5 (4) 87.5

12. The ratio of specific charge of a proton and α-particle is:-
(1) 2 : 1 (2) 1 : 2 (3) 1 : 4 (4) 1 : 1

13. In an atom $_{13}Al^{27}$, number of proton is (a) electron is (b) an neutron is (c). Hence ratio will be [in order c : b : a]
(1) 13 : 14 : 13 (2) 13 : 13 : 14 (3) 14 : 13 : 13 (4) 14 : 13 : 14

14. Atomic weight of ne is 20.2. ne is mixture of Ne^{20} and Ne^{22}, relative abundance of heavier isotope is :-
(1) 90 (2) 20 (3) 40 (4) 10

15. Number of protons, neutrons & electrons in the element $_{89}\gamma^{231}$ is :-
(1) 89, 231, 89 (2) 89, 89, 242 (3) 89, 142, 89 (4) 89, 71, 89

16. Atoms $_6C^{12}$ and $_8C^{17}$ are related to each other as :-
(1) Isotones (2) Isoelectronic (3) isodiaphers (4) Isosters

17. The e/m ratio is maximum for :-
(1) D^+ (2) He^+ (3) H^+ (4) He^{2+}

18. Let mass of electron is half, mass of proton is two times and mass of neutron is three fourth of original masses, then new atomic weight of O^{16} atom :-
(1) increases nu 37.5%
(2) remain constant
(3) increases by 12.5%
(4) decreases by 25%

19. Am isotone of $_{32}Ge^{76}$ is :-
(i) $_{32}Ge^{77}$ (ii) $_{33}As^{77}$ (iii) $_{34}Se^{77}$ (iv) $_{34}Se^{78}$
(1) (ii) & (iii)
(2) (i) & (ii)
(3) (ii) & (iv)
(4) (ii) & (iii) & (iv)

20. In $_7N^{14}$ if mass attributed to electrons were doubled & the mass attributed to protons were halved, the atomic mass would become approximately :-
(1) Halved (2) Doubled (3) Reduced by 25% (4) Remain same

21. The value of planck's constant is 6.63×10^{-34} Js. The velocity of light is 3.0510^8 ms^{-1}. Which value is closest to the wavelength in metres of a quantum of light with frequency of 8×10^{15} s^{-1}.

(1) 3×10^{7} (2) 2×10^{-25} (3) 5×10^{-18} (4) 3.75×10^{-8}

22. If change in energy (ΔE) = 3×10^{-8} J, h = 6.64×10^{-34} J-s and c = 3×10^{8} m/s, then wavelength of the light is
(1) 6.64×10^{3} Å (2) 6.64×10^{5} Å (3) 6.64×10^{-8} Å (4) 6.64×10^{18} Å

BOHR'S ATOMIC MODEL

23. Angular momentum in second Bohr orbit of H-atom is x. then find out angular momentum in 1^{st} excited state of Li^{+2} ion.
(1) 3x (2) 9x (3) $\frac{x}{2}$ (4) x

24. Angular momentum for P-shell electron is :-
(1) $\frac{3h}{\pi}$ (2) $\frac{\sqrt{2}h}{2\pi}$ (3) Zero (4) None

25. Multiplication of electron velocity and radius for a orbit in an atom is :-
(1) Proportional to mass of electron
(2) Proportional to square of mass of electron
(3) Inversely proportional to mass of electron
(4) Does not depend upon mass of electron

26. The radius of a shell for H-atom is 4.761 Å. The value of n is :-
(1) 3 (2) 9 (3) 5 (4) 4

27. In Bohr's atomic model radius of 1^{st} orbit or Hydrogen is 0.053 nm then radius of 3^{rd} orbit of Li^{+2} is :-
(1) 0.159 (2) 0.053 (3) 0.023 (4) 0.026

28. The first three radius ratio of Bohr orbits
(1) 1 : 0.5 : 0.5 (2) 1 : 2 : 3 (3) 1 : 4 : 9 (4) 1 : 8 : 27

29. For Li^{+2} ion, $r_2 : r_5$ will be :-
(1) 9 : 25 (2) 4 : 25 (3) 25 : 4 (4) 25 : 9

30. The ratio of the radii of two Bohr orbits of H-atoms is 4 : 1, what would be their nomenclature:-
(1) K & L (2) L & K (3) N & L (4) 2 & 3 both

31. The velocity of electron in third excited state Be^{3+} ion will be :-
(1) $\frac{3}{4}(2.188\times10^{8})$ ms^{-1} (2) $\frac{3}{4}(2.188\times10^{8})$ ms^{-1}
(3) (2.188×10^{6}) Kms^{-1} (4) (2.188×10^{3}) Kms^{-1}

32. The Bohr orbit radius for the hydrogen atom (n = 1) is approximately 0.530 Å. The radius for the first excited state (n = 2) will be :-
(1) 0.13 Å (2) 1.0 Å (3) 4.77 Å (4) 2.12 Å

33. According to Bohr theory, the radius (r) and velocity (v) of an electron vary with the increasing principal quantum number 'n' as :-
(1) r increases, v decreases (2) r and v both increases
(3) r and v both increases (4) r decreases, v increases

34. The ratio of radius of first orbit in hydrogen to the radius of first orbit in deuterium will be:-
(1) 1 : 1 (2) 1 : 2 (3) 2 : 1 (4) 4 : 1

35. For any H like system. The ratio of velocities of I, II & III orbit i.e., $V_1 : V_2 : V_3$ will be
(1) 1 : 2 : 3 (2) 1 : 1/2 : 1/3 (3) 3 : 2 : 1 (4) 1 : 1 : 1

36. The energy of H-atom in n^{th} orbit is E_n then energy in n^{th} orbit of singly ionized helium atom will be
(1) $4E_n$ (2) $E_n/4$ (3) $2E_n$ (4) $E_n/2$

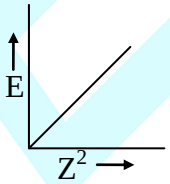
37. The energy of second Bohr orbit of the hydrogen atom is –328 KJ/mol. Hence the energy of fourth Bohr orbit should be :-
(1) –41 KJ/mol (2) –1312 KJ/mol (3) –164 KJ/mol (4) –82 KJ/mol

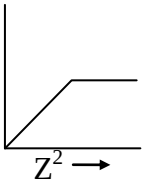
38. In a hydrogen atom, if energy of an electron in ground state is –13.6 eV, then energy in the 2^{nd} excited state is :-
(1) –1.51 eV (2) –3.4 eV (3) –6.04 eV (4) –13.6 eV

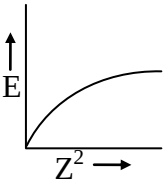
39. The ratio between kinetic energy and the total energy of the electrons of hydrogen atom according to Bohr's model is :-
(1) 2 : 1 (2) 1 : 1 (3) 1 : –1 (4) 1 : 2

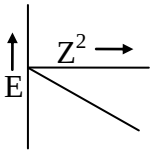
40. Potential energy is –27.2 eV in second orbit of He^+ then calculate, double of total energy in first excited state of hydrogen atom :-
(1) –13.6 eV (2) –54.4 eV (3) –6.8 eV (4) –27.2 eV

41. The energy levels for ${}_ZA^{(+z-1)}$ can be given by :-
(1) E_n for $A^{(+z-1)} = Z^2 \times E_n$ for H (2) E_n for $A^{(+z-1)} = Z \times E_n$ for H
(3) E_n for $A^{(+z-1)} = \frac{1}{Z^2} \times E_n$ for H (4) E_n for $A^{(+z-1)} = \frac{1}{Z} \times E_n$ for H

42. The graphical representation of energy of e^- and atomic number is :-
(1) 

(2) 

(3) 

(4) 

43. Going from K-shell to N-shell incase of H-atom :-
(1) Kinetic energy decreases (2) Total energy decreases
(3) Potential energy decreases (4) None of these

44. Maximum frequency of emission if obtained for the transition :-
(1) n = 2 to n = 1 (2) n = 6 to n = 2 (3) n = 1 to n = 2 (4) n = 2 to n = 6

45. If the ionization energy of hydrogen is 313.8 K cam per mole, then the energy of the electron in 2^{nd} excited state will be :-
(1) –113.2 Kcal/mole (2) –78.45 Kcal/mole
(3) –313.8 Kcal/mole (4) –35 Kcal/mole

46. Which of the following electron transition will require the largest amount of energy in a hydrogen atom :-
(1) From n = 1 to n = 2 (2) From n = 2 to n = 3
(3) From n = ∞ to n = 1 (4) From n = 3 to n = 5

47. If the potential energy (PE) of hydrogen electron is –3.02 eV then in which of the following excited level is electron present :-
(1) 1^{st} (2) 2^{nd} (3) 3^{rd} (4) 4^{th}

48. The radiation of low frequency will be emitted in which transition of hydrogen atom :-
(1) n = 1 to n = 4 (2) n = 2 to n = 5 (3) n = 3 to n = 1 (4) n = 5 to n = 2

49. A single electron orbits a stationary nucleus (z = 5). The energy required to excited the electron from third to fourth Bohr orbit will be :-
(1) 4.5 eV (2) 8.53 eV (3) 25 eV (4) 16.53 eV

50. The ratio of energies of hydrogen atom for first and second excited state is :-
(1) 4/1 (2) 1/4 (3) 4/9 (4) 9/4

51. $E_n = -313.6/n^2$. If the value of $E_n = -34.84$ then to which of the following values does 'n' correspond :-
(1) 1 (2) 2 (3) 3 (4) 4

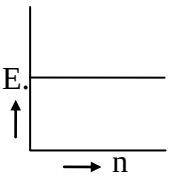
52. The ratio of potential energy and total energy of an electron in a Bohr orbit of hydrogen like species is :-
(1) 2 (2) –2 (3) 1 (4) –1

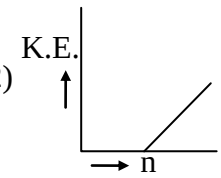
53. Which is not a correct order of energy for 1^{st}, 2^{nd}, & 3^{rd} orbit :-
(1) $E_1 < E_2 < E_3$ (2) $(PE)_1 < (PE)_2 < (PE)_3$
(3) $(KE)_1 < (KE)_2 < (KE)_3$ (4) '1' & '3' both

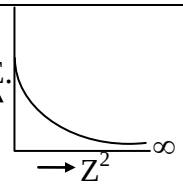
54. Which of the following is a correct relationship :-
(1) E_1 of H = 1/2 E_2 of He^+ = 1/3 E_3 of Li^{+2} = 1/4 E_4 of Be^{+3}
(2) E_1 (H) = E_2 (He^+) = E_3 (Li^{+2}) = E_4 of (Be^{+3})
(3) E_1 (H) = $2E_2$ (He^+) = $3E_3$ (Li^{+2}) = $4E_4$ of (Be^{+3})
(4) No relation

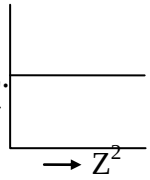
55. Which is correct for any H like species :-
(1) $(E_2 – E_1) > (E_3 – E_2) > (E_4 – E_3)$ (2) $(E_2 – E_1) < (E_3 – E_2) < (E_4 – E_3)$
(3) $(E_2 – E_1) = (E_3 – E_2) = (E_4 – E_3)$ (4) $(E_2 – E_1) = 1/4(E_3 – E_2) = 1/9\ (E_4 – E_3)$

56. Which of the following is a correct graph :-

(1) 

(2) 

(3) 

(4) 

57. First excitation potential of H atom is :
(1) 10.2 eV (2) 3.4 eV (3) 0 (4) –3.4 eV

58. energy required to remove an e^- from M shell of H-atom is 1.51 eV, then energy of first excited state will be :-
(1) –1.51 eV (2) +1.51 eV (3) –3.4 eV (4) –13.6 eV

59. The ionization potential of the hydrogen atom is 13.6 eV. The energy needed to ionize a hydrogen atom which is in its second excited state is about
(1) 13.6 eV (2) 10.2 eV (3) 3.4 eV (4) 1.5 eV

60. The ionization energy for excited hydrogen atom in eV will be :-
(1) 13.6 (2) Less than 13.6
(3) Greater than 13.6 (4) 3.4 or less

61. The energy required to excite an electron of H-atom from direst orbit second orbit is :-
(1) $\frac{3}{4}$ of its ionization energy (2) $\frac{1}{2}$ of its ionization energy
(3) $\frac{1}{4}$ of its ionization energy (4) None

62. The ionization potential of a singly ionized helium ion is equivalent to :-
(1) Kinetic energy of first orbit (2) Energy of last orbit
(3) Average energy in orbits (4) Maximum energy in orbits

63. The ionization energy for the H-atom is 13.6 eV, then the required energy to excite it from the ground state to next higher state will be :-
(1) 3.4 (2) 10.2 (3) 12.1 (4) 1.5

SPECTRUM AND SPECTRAL LINES

64. The spectrum of He is expected to the similar to that of:-
(1) H (2) Na (3) He^+ (4) Li^+

65. Third line of Balmer series is produced by which transition in spectrum of H-atom.
(1) 5 to 2 (2) 5 to 1 (3) 4 to 2 (4) 4 to 1

66. Which one of the following electron transition between energy levels produces the line of shortest wavelength in hydrogen spectrum ?
(1) $n_2 \rightarrow n_1$ (2) $n_3 \rightarrow n_1$ (3) $n_4 \rightarrow n_1$ (4) $n_4 \rightarrow n_3$

67. Which series have highest energy in hydrogen spectrum:-

(1) Balmer (2) Bracket (3) Pfund (4) Lyman

68. The ratio ofminimum frequency of Lyman & Balmer series will be :-
(1) 1.25 (2) 0.25 (3) 5.4 (4) 10

69. Which transition emits photon of maximum frequency :-
(1) Second spectral line of Balmer series (2) Second spectral line of Paschen series
(3) Fifth spectral line of Humphery series (4) First spectral line of Lyman series

70. Which one of the following species will give a series of spectral lines similar to that of Mg^{2+} :-
(1) Al^{3+} (2) Na (3) Mg^{+} (4) F

71. The ratio of minimum wavelengths of Lyman & Balmer series will be :-
(1) 1.25 (2) 0.25 (3) 3 (4) 10

72. The wavelength of photon obtained by electron transition between two levels in H-atom and singly ionized He are λ_1 and λ_2 respectively, then :-
(1) $\lambda_2 = \lambda_1$ (2) $\lambda_2 = 2\lambda_1$ (3) $\lambda_2 = \lambda_1 2$ (4) $\lambda_2 = \lambda_1 4$

73. Find out ratio of following for photon $(\nu_{max})_{Lyman} : (\nu_{max})_{Brakett}$
(1) 1 : 16 (2) 16 : 1 (3) 4 : 1 (4) 1 : 4

74. The ratio of wavelengths of first line of Lyman series in Li^{+2} and first line of Lyman series in deuterium ($_1H^2$) is :-
(1) 1 : 9 (2) 9 : 1 (3) 1 :4 (4) 4 : 1

75. In an electronic transition atom cannot emit :-
(1) Visible light (2) γ-rays (3) Infra red light (4) Ultra violet light

76. The first Lyman transition in the hydrogen spectrum has $\Delta E = 10.2$ eV. The same energy change is observed in the second Balmer transition of :-
(1) Li^{2+} (2) Li^{+} (3) He^{+} (4) Be^{3+}

77. The limiting line in Balmer series will have a frequency of :-
(1) $3.65 \times 10^{14} sec^{-1}$ (2) $3.29 \times 10^{15} sec^{-1}$ (3) $2.88 \times 10^{14} sec^{-1}$ (4) $-8.22 \times 10^{14} sec^{-1}$

78. If the shortest wavelength of Lyman series of H atom is x, then the wave length of first line of Balmer series of H atom will be :-
(1) $\frac{9x}{5}$ (2) $\frac{36x}{5}$ (3) $\frac{5x}{9}$ (4) $\frac{5x}{36}$

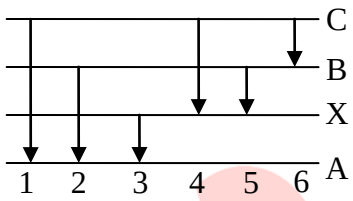
79. The first emission line in the H-atom spectrum in the Balmer series will have wave number :-
(1) $\frac{5R}{36} cm^{-1}$ (2) $\frac{3R}{4} cm^{-1}$ (3) $\frac{7R}{144} cm^{-1}$ (4) $\frac{9R}{400} m^{-1}$

80. What transition in He^{+} will have the same λ as the I line in Lyman series of H-atom
(1) $5 \rightarrow 3$ (2) $3 \rightarrow 2$ (3) $6 \rightarrow 4$ (4) $4 \rightarrow 2$

81. In H-atom, electron transits from 6^{th} orbit to 2^{nd} orbit in multi step. Then total spectral lines (without Balmer series) will be :-
(1) 6 (2) 10 (3) 4 (4) 0

82. An atom has x energy level, then total number of lines in its spectrum are :-
(1) 1 + 2 + 3……..(x + 1) (2) 1 + 2 + 3……..(x^2)
(3) 1 + 2 + 3……..(x – 1) (4) (x + 1)(x + 2) (x + 4)

83. The figure indicates the energy level diagram for the origin of six spectral lines in emission spectrum (e.g. line no. 5 arises from the transition from level B to X) which of the following spectral lines will not occur in the absorption spectrum :-



(1) 1, 2, 3 (2) 3, 2 (3) 4, 5, 6 (4) 3, 2, 1

84. A certain electronic transition from an excited state to ground state of the H_2 atom in one or more step gives rise to three lines in the ultra violet region of the spectrum. How many lines does this transition produce in the infrared region of the spectrum :-
(1) 1 (2) 2 (3) 3 (4) 4

85. Four lowest energy levels of H–atoms are shown in the figure. The number of emission lines could be :-

(1) 3 (2) 4 (3) 5 (4) 6

86. In the above problem, the number of absorption lines could be :-
(1) 3 (2) 4 (3) 5 (4) 6

87. If 9.9 eV energy is supplied to H atom, the no. of spectral lines emitted is equal to :-
(1) 0 (2) 1 (3) 2 (4) 3

DE-BROGLIE CONCEPT AND HEISENBERG PRINCIPLE

88. An electron has kinetic energy 2.8×10^{-23} J. de-Broglie wavelength will be nearly :-
($m_e = 9.1\times10^{-31}$ kg)
(1) 9.28×10^{-24} m (2) 9.28×10^{-7} m (3) 9.28×10^{-8} m (4) 9.28×10^{-10} m

89. What is the de-Broglie wavelength associated with the hydrogen electron in its third orbit :-
(1) 9.96×10^{-10} cm (2) 9.96×10^{-7} cm (3) 9.96×10^{4} cm (4) 9.96×10^{8} cm

90. If the de-Broglie wavelength of the fourth Bohr orbit of hydrogen atom is 4Å, the circumference of the orbit will be :-
(1) 4 Å (2) 4 Å (3) 16 Å (4) 16 m

91. No. of wave in fourth orbit :-
(1) 4 (2) 5 (3) 0 (4) 1

92. What is the ration of the De-Broglie wave lengths for electrons accelerated through 200 volts and 50 volts :-
(1) 1 : 2 (2) 2 : 1 (3) 3 : 10 (4) 10 : 3

93. For a valid Bohr orbit, its circumfrence should be :-
(1) = n λ (2) = (n – 1) λ (3) > n λ (4) < n λ

94. A particle X moving with a certain velocity has a de-Broglie wavelength of 1Å. If particle Y has a mass of 25% that of X and velocity 75% that of X, de-Broglies wavelength of Y will be :-
(1) 3 Å (2) 5.33 Å (3) 6.88 Å (4) 48 Å

95. The number of waves made by a Bohr electron in an orbit of maximum magnetic quantum number +2 :-
(1) 3 (2) 4 (3) 2 (4) 1

96. The uncertainty in position of an electron & helium atom are same. If the uncertainty in momentum for the electron is 32×10^5, then the uncertainty in momentum of helium atom will be
(1) 32×10^5 (2) 16×10^5 (3) 8×10^5 (4) None

97. The uncertainty in the position of an electron (mass 9.1×10^{-28}gm) moving with a velocity of 3×10^4 cm sec^{-1}, uncertainty in velocity is 0.011% will be :-
(1) 1.92 cm (2) 7.68 cm (3) 0.175 cm (4) 3.84 cm

98. Heisenberg Uncertainty principle is not valid for
(1) Moving electron (2) Motor car
(3) Stationary particles (4) 2 & 3 both

99. What should be the momentum (in gram centimeter per second) of a particle if its de-Broglie wavelength is 1Å and the value of h is 6.6252×10^{-27} erg second ?
(1) 6.6252×10^{-19} gcm/s (2) 6.6252×10^{-21} gcm/s
(3) 6.6252×10^{-24} gcm/s (4) 6.6252×10^{-27} gcm/s

100. What should be the mass of the photon of sodium if its wavelength is 5894Å, the velocity of light is 3×10^8 metre / second and the value of h is 6.6252×10^{-34} kg m^2/s ?
(1) 3.746×10^{-26} kg (2) 3.746×10^{-30} kg
(3) 3.746×10^{-34} kg (4) 3.746×10^{-36} kg

101. Which of the following has least de-Broglie λ ?
(1) e^- (2) p (3) CO_2 (4) SO_2

QUANTUM NUMBERS

102. The following quantum no. are possible for how many orbitals n = 3, λ = 2, m = +2
(1) 1 (2) 2 (3) 3 (4) 4

103. Number of possible orbitals (all types) in n = 3 energy level is :-
(1) 1 (2) 3 (3) 4 (4) 9

104. Which sub-shell is not permissible :-
(1) 2d (2) 4f (3) 6p (4) 3s

105. Nodal plane is found in which orbital.
(1) n = 2, λ = 0 (2) n = 3, λ = 0 (3) n = 2, λ = 1 (4) n = 1, λ = 0

106. No. of nodal surface in 2s orbital :-
(1) 0 (2) 1 (3) 2 (4) 3

107. Number of orbitals in h sub-shell is
(1) 11 (2) 15 (3) 17 (4) 19

108. How many quantum numbers are required to specify the position of electron :-
(1) 1 (2) 2 (3) 3 (4) 4

109. Which of the following is correct for a 4d-electron
(1) n = 4, λ = 2, s = $+\frac{1}{2}$ (2) n = 4, λ = 2, s = 0
(3) n = 4, λ = 3, s = 0 (4) n = 4, λ = 3, s = $+\frac{1}{2}$

110. If n = 3, then which value of 'λ' is correct :-
(1) 0 (2) 1 (3) 2 (4) All of them

111. Energy of atomic orbitals in a particular shell is in order :-
(1) s < p < d < f (2) s > p > d > f (3) p < d < f < s (4) f > d > s > p

112. Which statement is not correct for n = 5, m = 2 :-
(1) λ = 4 (2) λ = 0, 1, 2, 3, ; s = + 1/2
(3) λ = 3 (4) λ = 2, 3, 4

113. Spin angular momentum for electron :-
(1) $\sqrt{s(s+1)}\frac{h}{2\pi}$ (2) $\sqrt{2s(s+1)}\frac{h}{2\pi}$
(3) $\sqrt{s(s+2)}\frac{h}{2\pi}$ (4) None

114. The maximum number of electrons in a p-orbital with n = 6 and m = 0 can be :-

(1) 14 (2) 2 (3) 2 (4) 10

115. The total value of m for the electrons (n = 4) is :-
(1) 4 (2) 8 (3) 16 (4) 32

116. In an atom, for how many electrons, the quantum number will be, n = 3, λ = 2, m = +2, s = $+\frac{1}{2}$
(1) 18 (2) 6 (3) 24 (4) 1

117. Which orbital is represented by the complete wave function Ψ_{420} :-
(1) 4d (2) 3d (3) 4p (4) 4s

118. An electron in one of 4d orbital. Which of the following orbital quantum number value is not possible :-
(1) n = 4 (2) λ = 1 (3) m = 1 (4) m = 2

119. A neutral atom of an element has 2K, 8L, 11M and 2N electrons. The number of s-electron in the atom are
(1) 2 (2) 8 (3) 10 (4) 6

120. If λ = 3 then type and number of orbital is :-
(1) 3p, 3 (2) 4f, 14 (3) 5f, 7 (4) 3d, 5

121. Any nf-orbital can accommodate upto :-
(1) 14 electron (2) Six electrons
(3) Two electrons with parallel spin (4) Two electrons with opposite spin

122. n, λ and m values of an electron in $3p_y$ orbital are :-
(1) n = 3 ; λ = 1 and m = 1 (2) n = 3 ; λ = 1 and m = –1
(3) Both 1 and 2 are correct (4) None of these

123. $_{36}Kr$ has the electronic configuration ($_{18}Ar$) $4s^2\ 3d^{10}\ 4p^6$. The 39^{th} electron will go into which one of the following sub-levels :-
(1) 4f (2) 4d (3) 3p (4) 5s

124. The maximum probability of finding an electron in the d_{xy} orbital is :-
(1) Along the x-axis
(2) Along the y-axis
(3) At an angle of 45° from the x and y axis
(4) At an angle of 90° from the x and y axis

125. Which orbital has two angular nodal planes :-
(1) s (2) p (3) d (4) f

126. An orbital with λ = 0 is symmetrical about the :-
(1) x-axis only (2) y-axis only (3) z-axis only (4) The nucleus

127. If n & λ are principal and azimuthal quantum no. respectively then the expression for calculating the total no. of electron in any energy level is :-

(1) $\sum_{l=0}^{l=n} 2(2l+1)$ (2) $\sum_{l=1}^{l=n-1} 2(2l+1)$

(3) $\sum_{l=0}^{l=n+1} 2(2l+1)$ (4) $\sum_{l=0}^{l=n-1} 2(2l+1)$

RULES FOR FILLING OF ORBITALS

128. Which configuration does not obey pauli's exclusion principle :-

(1) ↑↓ | ↑ | | | (2) ↑↓ | ↑↑ | ↑ | | |

(3) ↑↓ | ↑↓ | ↑↓ | ↑ | | (4) ↑↓ | ↑↓ | ↑ | ↑ | |

129. Which of the following configuration follows the Hund's rule :-

(1) [He] 2s: ↑↓ | 2p: ↑ | ↑ | | (2) [He] 2s: ↑↓ | 2p: ↑↓ | ↑ | |

(3) [He] 2s: ↑↓ | 2p: ↑ | ↑↓ | | (4) [He] 2s: ↑↓ | 2p: ↑ | ↑ | |

130. The basis of three unpaired electrons present in the configuration of nitrogen is :-

(1) Aufbau principle (2) Pauli's principle

(3) Hund's principle (4) Uncertainty principle

131. The orbital with maximum energy is

(1) 3d (2) 5p (3) 4s (4) 6d

132. n and λ values of an orbital 'A' are 3 and 2, of another orbital 'B' are 5 and 0. The energy of

(1) B is more than A (2) A is more than B

(3) A and B are of same energy (4) None

133. No. of all subshells of n + λ = 7 is :-

(1) 4 (2) 5 (3) 6 (4) 7

134. Electronic configuration ⇅ | ⇅ | ⇅ | ⇅ | □

(1) Hund's rule (2) Pauli's principle

(3) Aufbau principle (4) (n + λ) rule

135. The total spin resulting from a d^9 configuration is :-

(1) $\frac{1}{2}$ (2) 2 (3) 1 (4) $\frac{3}{2}$

136. Which of the following transition neither shows absorption nor emission of energy in case of Hydrogen atom :-

(1) $3p_x \rightarrow 3s$ (2) $3d_{xy} \rightarrow 3d_{yz}$ (3) $3s \rightarrow 3d_{xy}$ (4) All the above

137. In ground state of Cr_{24}, number of orbitals with paired and unpaired electron :-
(1) 10 (2) 12 (3) 15 (4) 18

138. For Na (Z = 11) set of quantum numbers for last electron is :-
(1) n = 3, λ = 1, m = 1, $s = +\frac{1}{2}$ (2) n = 3, λ = 0, m = 0, $s = +\frac{1}{2}$
(3) n = 3, λ = 0, m = 1, $s = +\frac{1}{2}$ (4) n = 3, λ = 1, m = 1, $s = -\frac{1}{2}$

139. Which of the following set quantum numbers is correct for the 19th electron of Chromium

	n	**λ**	**m**	**s**
(1)	3	0	0	1/2
(2)	3	2	–2	1/2
(3)	4	0	0	1/2
(4)	4	1	–1	1/2

140. Which set of quantum number is correct for an electron in 3p orbital
(1) n = 3, λ = 2, m = 0, $s = +\frac{1}{2}$ (2) n = 3, λ = 0, m = +1, $s = +\frac{1}{2}$
(3) n = 3, λ = –2, m = –1, $s = +\frac{1}{2}$ (4) n = 3, λ = 1, m = 0, $s = +\frac{1}{2}$

141. An atom of Cr [Z = 24] loses 2 electrons. How many unpaired electrons shall be there in Cr^{+2}:
(1) 4 (2) 3 (3) 2 (4) 1

142. The atomic weight of an element is double its atomic number. If there are three electrons in 2p sub-shell, the element is :-
(1) C (2) N (3) O (4) Ca

143. The atomic number of an element is 17, the number of orbital containing electron pairs in the valance shell is :-
(1) 8 (2) 2 (3) 3 (4) 4

144. A transition metal 'X' has a configuration $[Ar]3d^5$ in its +3 oxidation state. Its atomic number is :-
(1) 22 (2) 26 (3) 28 (4) 19

145. $4s^2$ is the configuration of the outermost orbit of an element. Its atomic number would be :-
(1) 29 (2) 24 (3) 30 (4) 19

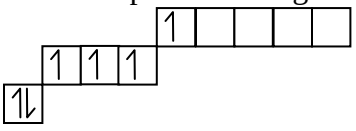
146. Sum of the paired electrons present in the orbital with l = 2 in all the species Fe^{2+}m Co^{2+} and Ni^{+2} are :-
(1) 9 (2) 12 (3) 6 (4) 15

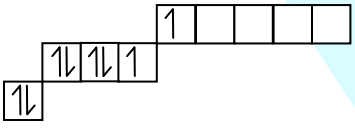
147. What is the electronic configuration of an element in its first excited state which is isoelectronic with O_2
(1) [Ne] $3s^1\ 3p^3\ 3d^1$ (2) [Ne] $3s^2\ 3p^4$
(3) [Ne] $3s^1\ 3p^3\ 3d^2$ (4) [Ne] $3s^1\ 3p^5$

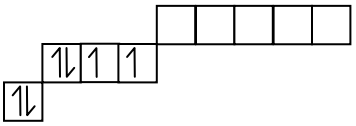
148. The quantum number of 20^{th} electron of Fe (Z = 26) ion would be :-
(1) 3, 2, –2, –½ (2) 3, 2, 0, ½ (3) 4, 0, 0, +½ (4) 4, 1, –1, +½

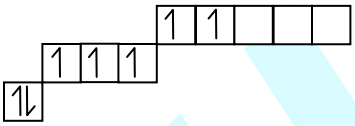
149. The atomic number of the element having maximum number of unpaired 3p electrons is (in ground state)
(1) 15 (2) 10 (3) 12 (4) 8

150. Which one represent is in ground state configuration

(1) 

(2) 

(3) 

(4) 

151. The electronic configuration of a dipositive metal ion M^{2+} is 2, 8, 14 and its ionic weight is 58 a.m.u. The number of neutrons in its nucleus would be :-
(1) 30 (2) 32 (3) 34 (4) 42

152. In an atom having 2K, 8L, 8M and 2N electrons, the number of electrons with m = 0; $S = +\frac{1}{2}$ are
(1) 6 (2) 2 (3) 8 (4) 16

153. The number of electrons in the M-shell of the element with atomic number 24 is :-
(1) 24 (2) 12 (3) 8 (4) 13

ANSWER KEY

EXERCISE-I (Conceptual Questions)

1.	(3)	**2.**	(1)	**3.**	(1)	**4.**	(3)	**5.**	(2)	**6.**	(2)	**7.**	(4)
8.	(1)	**9.**	(3)	**10.**	(2)	**11.**	(2)	**12.**	(1)	**13.**	(3)	**14.**	(4)
15.	(3)	**16.**	(3)	**17.**	(3)	**18.**	(1)	**19.**	(3)	**20.**	(3)	**21.**	(4)
22.	(3)	**23.**	(4)	**24.**	(1)	**25.**	(3)	**26.**	(1)	**27.**	(1)	**28.**	(3)
29.	(2)	**30.**	(4)	**31.**	(4)	**32.**	(4)	**33.**	(1)	**34.**	(1)	**35.**	(2)
36.	(1)	**37.**	(4)	**38.**	(1)	**39.**	(3)	**40.**	(3)	**41.**	(1)	**42.**	(4)
43.	(1)	**44.**	(1)	**45.**	(4)	**46.**	(1)	**47.**	(2)	**48.**	(4)	**49.**	(4)
50.	(4)	**51.**	(3)	**52.**	(1)	**53.**	(1)	**54.**	(2)	**55.**	(1)	**56.**	(3)
57.	(1)	**58.**	(3)	**59.**	(4)	**60.**	(4)	**61.**	(1)	**62.**	(1)	**63.**	(2)
64.	(4)	**65.**	(1)	**66.**	(3)	**67.**	(4)	**68.**	(3)	**69.**	(4)	**70.**	(1)
71.	(2)	**72.**	(4)	**73.**	(2)	**74.**	(1)	**75.**	(2)	**76.**	(3)	**77.**	(3)
78.	(2)	**79.**	(1)	**80.**	(4)	**81.**	(1)	**82.**	(3)	**83.**	(1)	**84.**	(1)
85.	(4)	**86.**	(1)	**87.**	(1)	**88.**	(3)	**89.**	(2)	**90.**	(3)	**91.**	(1)
92.	(1)	**93.**	(1)	**94.**	(2)	**95.**	(1)	**96.**	(1)	**97.**	(3)	**98.**	(4)
99.	(1)	**100.**	(4)	**101.**	(4)	**102.**	(1)	**103.**	(4)	**104.**	(1)	**105.**	(3)

106.	(2)	**107.**	(1)	**108.**	(3)	**109.**	(1)	**110.**	(4)	**111.**	(1)	**112.**	(2)
113.	(1)	**114.**	(3)	**115.**	(3)	**116.**	(4)	**117.**	(1)	**118.**	(2)	**119.**	(2)
120.	(3)	**121.**	(4)	**122.**	(3)	**123.**	(2)	**124.**	(3)	**125.**	(3)	**126.**	(4)
127.	(4)	**128.**	(2)	**129.**	(1)	**130.**	(3)	**131.**	(4)	**132.**	(1)	**133.**	(1)
134.	(1)	**135.**	(1)	**136.**	(4)	**137.**	(3)	**138.**	(2)	**139.**	(3)	**140.**	(4)
141.	(1)	**142.**	(2)	**143.**	(3)	**144.**	(2)	**145.**	(3)	**146.**	(2)	**147.**	(1)
148.	(3)	**149.**	(1)	**150.**	(3)	**151.**	(2)	**152.**	(1)	**153.**	(4)		