PRE-MEDICAL

PHYSICAL CHEMISTRY

ENTHUSIAST | LEADER | ACHIEVER

EXERCISE

Atomic Structure

ENGLISH MEDIUM

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
AS0001

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
AS0002

3. Find out the atoms 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) $^{14}_{6}C$, $^{14}_{7}N$, $^{19}_{9}F$
AS0003

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
AS0004

5. For any anion X^{-3}, the mass number is 14. If anion has10 electrons, then number of neutrons in X_2 nucleus :–
(1) 10 (2) 14
(3) 7 (4) 5
AS0005

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}
AS0006

7. (i) $^{54}_{26}Fe$, $^{56}_{26}Fe$, $^{57}_{26}Fe$, $^{58}_{26}Fe$ (a) Isotopes
(ii) $^{3}_{1}H$, $^{3}_{2}He$ (b) Isotones
(iii) $^{76}_{32}Ge$, $^{77}_{33}As$ (c) Isodiaphers
(iv) $^{235}_{92}U$, $^{231}_{90}Th$ (d) Isobars
(v) $^{1}_{1}H$, $^{2}_{1}D$, $^{3}_{1}T$
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
AS0008

8. 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
AS0009

9. 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
AS0011

10. The ratio of specific charge of a proton and an α–particle is :–
(1) 2 : 1 (2) 1 : 2 (3) 1 : 4 (4) 1 : 1
AS0012

11. In an atom $^{27}_{13}Al$, number of proton is (a), electron is (b) and 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
AS0013

12. Atomic weight of Ne is 20.2. Ne is mixture of ^{20}Ne and ^{22}Ne, relative abundance of heavier isotope is :-
(1) 90 (2) 20 (3) 40 (4) 10
AS0014

13. Number of protons, neutrons & electrons in the element $^{231}_{89}\gamma$ is :-
(1) 89, 231, 89 (2) 89, 89, 242
(3) 89, 142, 89 (4) 89, 71, 89
AS0015

14. Atoms $^{13}_{6}C$ and $^{17}_{8}O$ are related to each other as:-
(1) Isotones (2) Isoelectronic
(3) Isodiaphers (4) Isosters
AS0016

15. The e/m ratio is maximum for :-
(1) D^+ (2) He^+ (3) H^+ (4) He^{2+}
AS0017

16. An isotone of $^{76}_{32}Ge$ is :-
(i) $^{77}_{32}Ge$ (ii) $^{77}_{33}As$
(iii) $^{77}_{34}Se$ (iv) $^{78}_{34}Se$
(1) (ii) & (iii) (2) (i) & (ii)
(3) (ii) & (iv) (4) (ii) & (iii) & (iv)
AS0019

17. In $^{14}_{7}N$ 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
AS0020

18. The value of planck's constant is 6.63×10^{-34} Js. The velocity of light is 3.0×10^{8} m s^{-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}
AS0021

19. The energy of one mole photons of radiation having frequency 5.01×10^{14} Hz is :
(1) 160 KJ mol^{-1} (2) 180 KJ mol^{-1}
(3) 200 KJ mol^{-1} (4) 220 KJ mol^{-1}
AS0265

BOHR'S ATOMIC MODEL

20. Angular momentum in second Bohr orbit of H-atom is x. Then find out angular momentum in Ist excited state of Li^{+2} ion :
(1) 3x (2) 9x (3) $\frac{x}{2}$ (4) x
AS0023

21. 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
AS0025

22. The radius of a shell for H-atom is 4.761Å. The value of n is :-
(1) 3 (2) 9 (3) 5 (4) 4
AS0026

23. In Bohr's atomic model radius of Ist orbit of Hydrogen is 0.053 nm then radius of 3rd orbit of Li^{+2} is :
(1) 0.159 nm (2) 0.053 nm
(3) 0.023 nm (4) 0.026 nm
AS0027

24. The radius ratio of first three Bohr orbits is :-
(1) 1 : 0·5 : 0·5 (2) 1 : 2 : 3
(3) 1 : 4 : 9 (4) 1 : 8 : 27
AS0028

25. For Li^{+2} ion, $r_2 : r_5$ will be :-
(1) 9 : 25 (2) 4 : 25 (3) 25 : 4 (4) 25 : 9
AS0029

26. The ratio of the radii of two Bohr orbits of H-atom is 4 : 1, what would be their nomenclature :-
(1) K & L (2) L & K
(3) N & L (4) 2 & 3 both
AS0030

27. The velocity of electron in third excited state of Be^{3+} ion will be :–
(1) $\frac{3}{4}(2.188 \times 10^{8})ms^{-1}$
(2) $\frac{3}{4}(2.188 \times 10^{6})ms^{-1}$
(3) (2.188×10^{6}) Kms^{-1}
(4) (2.188×10^{3}) Kms^{-1}
AS0031

28. 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) 1.06 Å (3) 4.77 Å (4) 2.12 Å
AS0032

29. 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
AS0034

30. For any H like system, the ratio of velocities of electron in 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
AS0035

31. The energy of H–atom in nth orbit is E_n, then energy in nth orbit of singly ionised helium ion will be:-
(1) $4E_n$ (2) $E_n/4$
(3) $2E_n$ (4) $E_n/2$
AS0036

32. 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

AS0037

33. 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

AS0038

34. The ratio between kinetic energy and the total energy of the electron of hydrogen atom according to Bohr's model is :-

(1) 2 : 1 (2) 1 : 1

(3) 1 : –1 (4) 1 : 2

AS0039

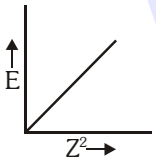
35. Potential energy is – 27.2 eV in second orbit of He^+, then calculate double of total energy in first excited state of hydrogen atom :–

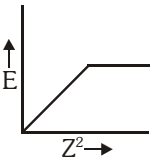
(1) – 13.6 eV (2) – 54.4 eV

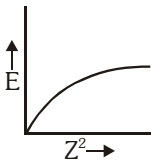
(3) – 6.8 eV (4) – 27.2 eV

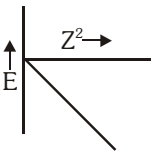
AS0040

36. The graphical representation of energy of electron and atomic number is :-

(1) 

(2) 

(3) 

(4) 

AS0042

37. Going from K–shell to N–shell in case of H–atom :-

(1) Kinetic energy decreases

(2) Total energy decreases

(3) Potential energy decreases

(4) None of these

AS0043

38. Maximum frequency of emission is 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

AS0044

39. If the ionization energy of hydrogen is 313.8 kcal per mol, then the energy of the electron in 2^{nd} excited state will be :-

(1) –113.2 kcal/mol (2) –78.45 kcal/mol

(3) –313.8 kcal/mol (4) –35 kcal/mol

AS0045

40. 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

AS0046

41. If the potential energy (PE) of electron of hydrogen atom 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}

AS0047

42. 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

AS0048

43. 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

AS0050

44. $E_n = -313.6/n^2$. 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

AS0051

45. 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

AS0052

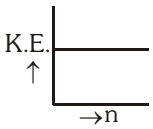
46. Which is not a correct order of energy for 1st, 2nd & 3rd orbit :-
(1) $E_1 > E_2 > E_3$
(2) $(PE)_1 < (PE)_2 < (PE)_3$
(3) $(KE)_1 > (KE)_2 > (KE)_3$
(4) '1' & '3' both

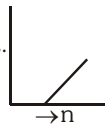
AS0053

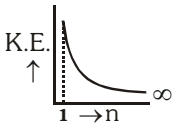
47. Which is correct for any H like species :-
(1) $(E_2 - E_1) > (E_3 - E_2) > (E_4 - E_3)$
(2) $(E_2 - E_1) < (E_3 - E_2) < (E_4 - E_3)$
(3) $(E_2 - E_1) = (E_3 - E_2) = (E_4 - E_3)$
(4) $(E_2 - E_1) = 1/4\ (E_3 - E_2) = 1/9\ (E_4 - E_3)$

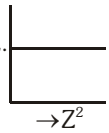
AS0055

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

(1) 

(2) 

(3) 

(4) 

AS0056

49. First excitation potential of H atom is :
(1) 10.2 eV (2) 3.4 eV
(3) 1.51 eV (4) – 3.4 eV

AS0057

50. 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

AS0058

51. The ionisation potential of the hydrogen atom is 13.6 eV. The energy needed to ionise 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) 1.51 eV

AS0059

52. The ionisation 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

AS0060

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

AS0061

54. The ionisation potential of a singly ionised 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

AS0062

SPECTRUM AND SPECTRAL LINES

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

AS0064

56. Third line of Balmer series is produced by which transition in spectrum of H–atom
(1) n = 5 to n = 2 (2) n = 5 to n = 1
(3) n = 4 to n = 2 (4) n = 4 to n = 1

AS0065

57. Which one of the following electronic 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) $n_4 \rightarrow n_3$

AS0066

58. Which series have highest energy in hydrogen spectrum :-
(1) Balmer (2) Brackett
(3) Pfund (4) Lyman

AS0067

59. The ratio of minimum frequency of Lyman & Balmer series will be :–
(1) 1.25 (2) 0.25 (3) 5.4 (4) 10

AS0068

60. 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

AS0069

61. 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

AS0070

62. The ratio of minimum wavelengths of Lyman & Balmer series will be :–
(1) 1.25 (2) 0.25 (3) 5 (4) 10

AS0071

63. The wavelength of photon obtained by electron transition between two levels in H– atom and singly ionised 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) $\lambda_2 = \lambda_1/4$

AS0072

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

AS0073

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

AS0074

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

AS0075

67. 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+}

AS0076

68. 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) $8.22 \times 10^{14}\ sec^{-1}$ (4) $-8.22 \times 10^{14}\ sec^{-1}$

AS0077

69. 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) $\frac{9R}{400} cm^{-1}$

AS0079

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

AS0080

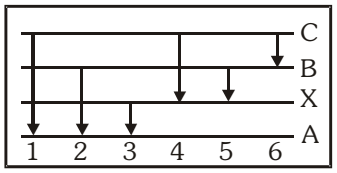
71. In H–atom, electron transits from 6th orbit to 2nd orbit in multi step. Then total spectral lines (without Balmer series) will be :–
(1) 6 (2) 10 (3) 4 (4) 0

AS0081

72. 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)

AS0082

73. 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

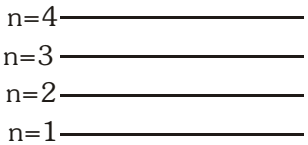


AS0083

74. A certain electronic transition from an excited state to ground state of the H 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

AS0084

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



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

AS0085

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

AS0086

77. 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

AS0087

78. Frequency of photons emitted in Paschen series is given by $v = 3.29 \times 10^{15}$ (hz) $\left[\frac{1}{3^2} - \frac{1}{n^2}\right]$. Value of n for photon having wavelength 1285 nm will be :
(1) n = 3 (2) n = 4 (3) n = 5 (4) n = 6

AS0266

DE-BROGLIE CONCEPT AND HEISENBERG PRINCIPLE

79. An electron has a kinetic energy of 2.8×10^{-23} J. de-Broglie wavelength will be nearly :- ($m_e = 9.1 \times 10^{-31}$ 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

AS0088

80. 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^{-8} cm
(3) 9.96×10^{4} cm (4) 9.96×10^{8} cm

AS0089

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

AS0090

82. Number of waves in fourth orbit is :–
(1) 4 (2) 5 (3) 0 (4) 1

AS0091

83. What is the ratio of the de-Broglie wavelengths for electrons accelerated through 200 volts and 50 volts :-
(1) 1 : 2 (2) 2 : 1
(3) 3 : 10 (4) 10 : 3

AS0092

84. For a valid Bohr orbit, its circumference should be
(1) = n λ (2) = (n – 1)λ
(3) > n λ (4) < n λ

AS0093

85. 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

AS0095

86. The uncertainity in position of an electron & helium atom are same. If the uncertainity in momentum for the electron is 32×10^5 g cm s^{-1}, then the uncertainity in momentum of helium atom will be
(1) 32×10^5 g cm s^{-1} (2) 16×10^5 g cm s^{-1}
(3) 8×10^5 g cm s^{-1} (4) None of these

AS0096

87. Calculate the uncertainty in the position of an electron (mass 9.1×10^{-28}g) moving with a velocity of 3×10^4 cm sec^{-1}, if the uncertainity in velocity is 0.011% ?
(1) 1.92 cm (2) 7.68 cm
(3) 0.175 cm (4) 3.84 cm

AS0097

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

AS0098

89. What should be the momentum (in gram centimetre 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

AS0099

90. Which of the following has least de-Broglie wavelength, moving with same speed ?
(1) e^- (2) p (3) CO_2 (4) SO_2

AS0101

QUANTUM NUMBERS

91. The following quantum no. are possible for how many orbitals n = 3, ℓ = 2, m = +2 ?
(1) 1 (2) 2 (3) 3 (4) 4
AS0102

92. Number of possible orbitals (all types) in n = 3 energy level is :-
(1) 1 (2) 3
(3) 4 (4) 9
AS0103

93. Which sub–shell is not permissible :–
(1) 2d (2) 4f
(3) 6p (4) 3s
AS0104

94. Nodal plane is found in which orbital :-
(1) n = 2, ℓ = 0
(2) n = 3, ℓ = 0
(3) n = 2, ℓ = 1
(4) n = 1, ℓ = 0
AS0105

95. No. of nodal surface in 2s orbital :-
(1) 0 (2) 1 (3) 2 (4) 3
AS0106

96. Number of orbitals in h sub-shell is
(1) 11 (2) 15 (3) 17 (4) 19
AS0107

97. How many quantum numbers are required to specify the position of electron :-
(1) 1 (2) 2 (3) 3 (4) 4
AS0108

98. Which of the following is correct for a 4d–electron
(1) n = 4, ℓ = 2, s = + $\frac{1}{2}$
(2) n = 4, ℓ = 2, s = 0
(3) n = 4, ℓ = 3, s = 0
(4) n = 4, ℓ = 3, s = + $\frac{1}{2}$
AS0109

99. If n = 3, then which value of 'ℓ' is correct :–
(1) 0 (2) 1
(3) 2 (4) All of them
AS0110

100. 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
AS0111

101. Which statement is not correct for n = 5, m = 2 :-
(1) ℓ = 4
(2) ℓ = 0, 1,2,3 ; s = + 1/2
(3) ℓ = 3
(4) ℓ = 2, 3, 4
AS0112

102. Spin angular momentum for electron is :-
(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
AS0113

103. The maximum number of electrons in a p–orbital with n = 6 and m = 0 can be :-
(1) 14 (2) 6 (3) 2 (4) 10
AS0114

104. The total number of value of m for the electrons in n = 4 is -
(1) 4 (2) 8 (3) 16 (4) 32
AS0115

105. In an atom, for how many electrons, the quantum numbers will be n = 3, ℓ = 2, m = + 2, s = + $\frac{1}{2}$:-
(1) 18 (2) 6 (3) 24 (4) 1
AS0116

106. Which orbital is represented by the complete wave function ψ_{420} :-
(1) $4d_{z^2}$ (2) $3d_{z^2}$ (3) $4p_z$ (4) 4s
AS0117

107. An electron is in one of 4d orbital. Which of the following quantum number value is not possible :-
(1) n = 4 (2) ℓ = 1
(3) m = 1 (4) m = 2
AS0118

108. A neutral atom of an element has 2K, 8L, 11 M and 2N electrons. The number of s-electron in the atom are
(1) 2 (2) 8 (3) 10 (4) 6
AS0119

109. If ℓ = 3 then type and number of orbital is :–

(1) 3p, 3 (2) 4f, 14 (3) 5f, 7 (4) 3d, 5

AS0120

110. Any nf–orbital can accomodate upto :–

(1) 14 electron

(2) Six electrons

(3) Two electrons with parallel spin

(4) Two electrons with opposite spin

AS0121

111. n, ℓ and m values of an electron in $3p_y$ orbital are :-

(1) n = 3 ; ℓ = 1 and m = 1

(2) n = 3 ; ℓ = 1 and m = –1

(3) Both 1 and 2 are correct

(4) None of these

AS0122

112. 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

AS0124

113. Which orbital has two angular nodal planes :-

(1) s (2) p (3) d (4) f

AS0125

114. An orbital with ℓ = 0 is symmetrical about the :-

(1) x-axis only (2) y-axis only

(3) z-axis only (4) nucleus

AS0126

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

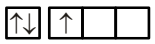
(1) $\sum_{\ell=0}^{\ell=n} 2(2\ell+1)$ (2) $\sum_{\ell=1}^{\ell=n-1} 2(2\ell+1)$

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

AS0127

RULES FOR FILLING OF ORBITALS

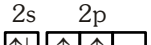
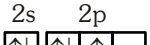
116. Which configuration does not obey pauli's exclusion principle :-

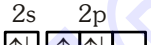
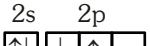
(1)  (2) 

(3)  (4) 

AS0128

117. Which of the following configuration follows the Hund's rule :–

(1) [He]  (2) [He] 

(3) [He]  (4) [He] 

AS0129

118. 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

AS0130

119. The orbital with maximum energy is :-

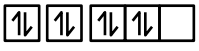
(1) 3d (2) 5p (3) 4s (4) 6d

AS0131

120. No. of all subshells having n + ℓ = 7 is:-

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

AS0133

121. Electronic configuration 

has violated :–

(1) Hund's rule

(2) Pauli's principle

(3) Aufbau principle

(4) (n + ℓ) rule

AS0134

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

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

AS0135

123. 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

AS0136

124. In ground state of $_{24}Cr$, number of orbitals with paired and unpaired electron :-

(1) 10 (2) 12 (3) 15 (4) 18

AS0137

125. For Na (Z = 11) set of quantum numbers for last electron is:–

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

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

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

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

AS0138

126. Which of the following set of quantum numbers is correct for the 19th electron of Chromium :-

	n	**ℓ**	**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

AS0139

127. Which set of quantum number is correct for an electron in 3p orbital :-

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

(2) $n = 3, \ell = 0, m = +1, S = +\frac{1}{2}$

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

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

AS0140

128. 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

AS0141

129. The atomic number of an element is 17, the number of orbitals containing electron pairs in the valence shell is:-

(1) 8 (2) 2

(3) 3 (4) 6

AS0143

130. 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

AS0144

131. $4s^2$ is the configuration of the outermost orbit of an element. Its atomic number would be :–

(1) 29 (2) 24

(3) 30 (4) 19

AS0145

132. Sum of the paired electrons present in the orbital with $\ell = 2$ in all the species Fe^{2+}, Co^{2+} and Ni^{+2} are:–

(1) 9 (2) 12

(3) 6 (4) 15

AS0146

133. The quantum number of 20th electron of Fe(Z = 26) would be :–

(1) 3, 2, – 2, – ½

(2) 3, 2, 0, ½

(3) 4, 0, 0, + ½

(4) 4, 1, – 1, + ½

AS0148

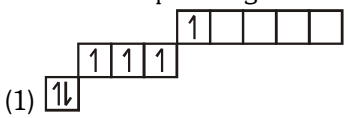
134. The atomic number of the element having maximum number of unpaired 3p electrons is (in ground state):-

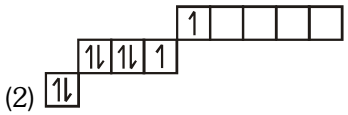
(1) 15 (2) 10

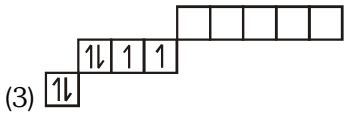
(3) 12 (4) 8

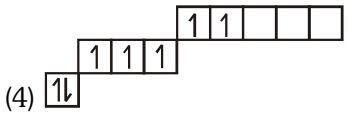
AS0149

135. Which one represent ground state configuration :-

(1) 

(2) 

(3) 

(4) 

AS0150

136. 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

AS0152

EXERCISE-I (Conceptual Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**3**	**1**	**1**	**3**	**2**	**2**	**1**	**3**	**2**	**1**	**3**	**4**	**3**	**3**	**3**
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	**3**	**3**	**4**	**3**	**4**	**3**	**1**	**1**	**3**	**2**	**4**	**4**	**4**	**1**	**2**
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	**1**	**4**	**1**	**3**	**3**	**4**	**1**	**1**	**4**	**1**	**2**	**4**	**4**	**3**	**1**
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	**1**	**1**	**3**	**1**	**3**	**4**	**4**	**1**	**1**	**4**	**1**	**3**	**4**	**3**	**4**
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	**1**	**2**	**4**	**2**	**1**	**2**	**3**	**3**	**1**	**4**	**1**	**3**	**3**	**1**	**4**
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	**1**	**1**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**	**1**	**3**	**4**	**1**	**4**
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	**1**	**4**	**1**	**3**	**2**	**1**	**3**	**1**	**4**	**1**	**2**	**1**	**3**	**3**	**4**
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	**1**	**2**	**2**	**3**	**4**	**3**	**3**	**3**	**4**	**4**	**2**	**1**	**3**	**4**	**1**
Que.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Ans.	**1**	**1**	**4**	**3**	**2**	**3**	**4**	**1**	**3**	**2**	**3**	**2**	**3**	**1**	**3**
Que.	136														
Ans.	**1**														

EXERCISE-II (Previous Year Questions) AIPMT/NEET

AIPMT 2009

1. Maximum number of electrons in a subshell of an atom is determined by the following :-
(1) $2n^2$ (2) $4\ell + 2$
(3) $2\ell + 1$ (4) $4\ell - 2$

AS0156

2. Which of the following is not permissible set of quantum numbers in an atom ?
(1) n = 3, ℓ = 2, m = –2, s = –1/2
(2) n = 4, ℓ = 0, m = 0, s = –1/2
(3) n = 5, ℓ = 3, m = 0, s = +1/2
(4) n = 3, ℓ = 2, m = –3, s = –1/2

AS0157

AIPMT 2010

3. A 0.66 kg ball is moving with a speed of 100 m/s. The associated wavelength will be (h = 6.6×10^{-34} Js) :-
(1) 6.6×10^{-34} m (2) 1.0×10^{-35} m
(3) 1.0×10^{-32} m (4) 6.6×10^{-32} m

AS0158

AIPMT Pre-2011

4. The total number of atomic orbitals in fourth energy level of an atom is :-
(1) 8 (2) 16 (3) 32 (4) 4

AS0159

5. The energies E_1 and E_2 of two radiations are 25 eV and 50eV respectively. The relation between their wavelengths i.e. λ_1 and λ_2 will be :
(1) $\lambda_1 = \lambda_2$ (2) $\lambda_1 = 2\lambda_2$
(3) $\lambda_1 = 4\lambda_2$ (4) $\lambda_1 = \frac{1}{2}\lambda_2$

AS0160

6. If n = 6, the correct sequence for filling of electrons will be :
(1) ns → (n–2)f → (n–1)d → np
(2) ns → (n–1)d → (n–2)f → np
(3) ns → (n–2)f → np → (n–1)d
(4) ns → np (n–1)d → (n–2)f

AS0161

AIPMT Mains 2011

7. According to the Bohr Theory, which of the following transitions in the hydrogen atom will give rise to the least energetic photon ?
(1) n = 5 to n = 3 (2) n = 6 to n = 1
(3) n = 5 to n = 4 (4) n = 6 to n = 5

AS0162

AIPMT PRE 2012

8. Maximum number of electrons in a subshell with ℓ = 3 and n = 4 is :-
(1) 10 (2) 12 (3) 14 (4) 16

AS0165

9. The correct set of four quantum numbers for the valence electron of rubidium atom (Z = 37) is:-
(1) 5, 0, 0, + ½ (2) 5, 1, 0, + ½
(3) 5, 1, 1, + ½ (4) 6, 0, 0 + ½

AS0166

AIPMT MAINS 2012

10. The orbital angular momentum of a p-electron is given as :-
(1) $\sqrt{\frac{3}{2}}\frac{h}{\pi}$ (2) $\sqrt{6}.\frac{h}{2\pi}$
(3) $\frac{h}{\sqrt{2}\pi}$ (4) $\sqrt{3}\frac{h}{2\pi}$

AS0167

NEET UG 2013

11. 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} ?
(1) 75 (2) 10
(3) 25 (4) 50

AS0170

12. Based on equation $E = -2.178 \times 10^{-18}$ J $\left(\frac{Z^2}{n^2}\right)$ certain conclusions are written. Which of them is **not** correct ?
(1) For n = 1, the electron has a more negative energy than it does for n = 6 which means that the electron is more loosely bound in the smallest allowed orbit.
(2) The negative sign in equation simply means that the energy of electron bound to the nucleus is lower than it would be if the electrons were at the infinite distance from the nucleus
(3) Larger the value of n, the larger is the orbit radius
(4) Equation can be used to calculate the change in energy when the electron change orbit

AS0171

13. What is the maximum numbers of electrons that can be associated with the following set of quantum numbers $\Rightarrow$ n = 3; ℓ = 1 and m = –1 ?

(1) 2 (2) 10
(3) 6 (4) 4

AS0172

AIPMT 2014

14. What is the maximum number of orbitals that can be identified with the following quantum numbers. n = 3, ℓ = 1, m_ℓ = 0 ?

(1) 1 (2) 2
(3) 3 (4) 4

AS0174

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

(1) 6.67×10^{15} (2) 6.67×10^{11}
(3) 4.42×10^{-15} (4) 4.42×10^{-18}

AS0175

16. Magnetic moment 2.83 BM is given by which of the following ions ?
(At. no. Ti = 22, Cr = 24, Mn = 25, Ni = 28):-

(1) Ti^{3+} (2) Ni^{2+}
(3) Cr^{3+} (4) Mn^{2+}

AS0176

AIPMT 2015

17. Which of the following pairs of ions are isoelectronic and isostructural ?

(1) ClO_3^-, CO_3^{2-} (2) SO_3^{2-}, NO_3^-
(3) ClO_3^-, SO_3^{2-} (4) CO_3^{2-}, SO_3^{2-}

AS0178

18. The number of d-electrons in Fe^{2+} (Z = 26) is not equal to the number of electrons in which one of the following?

(1) p-electrons in Cl (Z = 17)
(2) d-electrons in Fe (Z = 26)
(3) p-electrons in Ne (Z = 10)
(4) s-electrons in Mg (Z = 12)

AS0179

19. Magnetic moment 2.84 B.M. is given by :-
(At. no.), Ni = 28, Ti = 22, Cr = 24, Co = 27)

(1) Ti^{3+} (2) Cr^{2+}
(3) Co^{2+} (4) Ni^{2+}

AS0180

20. The angular momentum of electron in 'd' orbital is equal to :-

(1) $\sqrt{2}\,\hbar$ (2) $2\sqrt{3}\,\hbar$
(3) 0 $\hbar$ (4) $\sqrt{6}\,\hbar$

AS0181

RE-AIPMT 2015

21. Which is the correct order of increasing energy of the listed orbitals in the atom of titanium ?

(At. no. Z = 22)
(1) 3s 3p 3d 4s
(2) 3s 3p 4s 3d
(3) 3s 4s 3p 3d
(4) 4s 3s 3p 3d

AS0182

NEET-I 2016

22. Two electrons occupying the same orbital are distinguished by :-

(1) Principal quantum number
(2) Magnetic quantum number
(3) Azimuthal quantum number
(4) Spin quantum number

AS0184

NEET-II 2016

23. Which of the following pairs of d-orbitals will have electron density along the axis ?

(1) $d_{z^2}, d_{x^2-y^2}$ (2) $d_{xy}, d_{x^2-y^2}$
(3) d_{z^2}, d_{xz} (4) d_{xz}, d_{yz}

AS0185

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

(1) 10 (2) 14
(3) 2 (4) 6

AS0186

NEET(UG) 2017

25. Which one is the wrong statement ?

(1) The uncertainty principle is $\Delta E \times \Delta t \geq h/4\pi$

(2) Half filled and fully filled orbitals have greater stability due to greater exchange energy, greater symmetry and more balanced arrangement.

(3) The energy of 2s orbital is less than the energy of 2p orbital in case of Hydrogen like atoms

(4) de-Broglie's wavelength is given by $\lambda = \frac{h}{mv}$, where m = mass of the particle, v = velocity of the particle

AS0188

NEET(UG) 2018

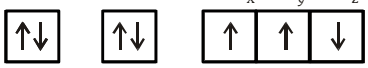
26. Which one is a **wrong** statement ?

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

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

(3) The electronic configuration of N atom is

$1s^2$ $2s^2$ $2p^1_x$ $2p^1_y$ $2p^1_z$



(4) The value of m for d_{z^2} is zero

AS0191

NEET(UG) 2019

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

(1) Lyman series (2) Balmer series

(3) Paschen series (4) Brackett series

AS0267

Odisha NEET(UG) 2019

28. Orbital having 3 angular nodes and 3 total nodes is :-

(1) 5 p (2) 3 d

(3) 4 f (4) 6 d

AS0268

29. In hydrogen atom, the de Broglie wavelength of an electron in the second Bohr orbit is :-
[Given that Bohr radius, a_0 = 52.9 pm]

(1) 211.6 pm (2) 211.6 π pm

(3) 52.9 π pm (4) 105.8 pm

AS0269

NEET (UG) 2020

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

(1) 175, 104 and 71 (2) 71, 104 and 71

(3) 104, 71 and 71 (4) 71, 71 and 104

AS0313

NEET (UG) 2020 (COVID-19)

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

(1) 0 and 2, respectively

(2) 1 and 0, respectively

(3) 3 and 0, respectively

(4) 0 and 1, respectively

AS0314

NEET (UG) 2021

32. A particular station of All India Radio, New Delhi, broadcasts on a frequency of 1,368 kHz (kilohertz). The wavelength of the electromagnetic radiation emitted by the transmitter is :

[speed of light $c = 3.0 \times 10^8\ ms^{-1}$]

(1) 219.3 m (2) 219.2 m

(3) 2192 m (4) 21.92 cm

AS0315

NEET(UG) 2021 (Paper-2)

33. The work function for a metal is 4 eV. To emit a photoelectron of zero velocity from the surface of the metal, the wavelength of incident light should be

(1) 2700 Å

(2) 1700 Å

(3) 5900 Å

(4) 3100 Å

AS0316

NEET (UG) 2022

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

(1) 15.87 pm

(2) 1.587 pm

(3) 158.7 Å

(4) 158.7 pm

AS0317

NEET (UG) 2022 (OVERSEAS)

35. A monochromatic infrared range finder of power 1 mW emits photons with wavelength 1000 nm in 0.1 second. The number of photons emitted in 0.1 second is

(Given : $h = 6.626 \times 10^{-34}$ Js, $c = 3 \times 10^8\ ms^{-1}$, Avogadro number = 6.022×10^{23})

(1) 5×10^{14} (2) 30×10^{34}

(3) 5×10^{11} (4) 30×10^{37}

AS0318

Re-NEET (UG) 2022

36. When electromagnetic radiation of wavelength 300 nm falls on the surface of a metal, electrons are emitted with the kinetic energy of 1.68×10^5 J mol^{-1}. What is the minimum energy needed to remove an electron from the metal ?
($h = 6.626 \times 10^{-34}$ Js, $c = 3 \times 10^8$ ms^{-1}, $N_A = 6.022 \times 10^{23}$ mol^{-1})
(1) 2.31×10^6 J mol^{-1}
(2) 3.84×10^4 J mol^{-1}
(3) 3.84×10^{-19} J mol^{-1}
(4) 2.31×10^5 J mol^{-1}

AS0319

37. Match **List-I** with **List-II** :

	List-I (quantum number)		**List-II (Orbital)**
(a)	n = 2, ℓ = 1	(i)	2 s
(b)	n = 3, ℓ = 2	(ii)	3 s
(c)	n = 3, ℓ = 0	(iii)	2 p
(d)	n = 2, ℓ = 0	(iv)	3 d

Choose the **correct answer** from the options given below :
(1) (a) – (iii), (b) – (iv), (c) – (i), (d) – (ii)
(2) (a) – (iv), (b) – (iii), (c) – (i), (d) – (ii)
(3) (a) – (iv), (b) – (iii), (c) – (ii), (d) – (i)
(4) (a) – (iii), (b) – (iv), (c) – (ii), (d) – (i)

AS0320

EXERCISE-II (Previous Year Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**2**	**4**	**2**	**2**	**2**	**1**	**4**	**3**	**1**	**3**	**4**	**1**	**1**	**1**	**4**
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	**2**	**3**	**1**	**4**	**4**	**2**	**4**	**1**	**3**	**3**	**3**	**2**	**3**	**2**	**2**
Que.	31	32	33	34	35	36	37								
Ans.	**1**	**1**	**4**	**4**	**1**	**4**	**4**								

EXERCISE-III (Analytical Questions) Master Your Understanding

1. The frequency of radiation emitted when the electron falls from n = 4 to n =1 in a hydrogen atom will be (Given ionization energy of H = $2{\cdot}18 \times 10^{-18}$ J atom^{-1}) :-
(1) $1{\cdot}03 \times 10^{15}$ s^{-1}
(2) $3{\cdot}08 \times 10^{15}$ s^{-1}
(3) $2{\cdot}00 \times 10^{15}$ s^{-1}
(4) $1{\cdot}54 \times 10^{15}$ s^{-1}

AS0198

2. Which orbital diagram does not obey Aufbau principle :-
(1) ⇵ | ↿⇂ | 1 | 1 (2) ↓ | ↿⇂ | 1 | 1
(3) ↿⇂ | ↿⇂ | ↿⇂ | 1 (4) ↿⇂ | 1 | 1 | 1

AS0199

3. Quantum number which cannot be calculated by schrodinger wave equation is:-
(1) n (2) ℓ (3) m (4) s

AS0200

4. $\frac{h}{2\pi}$ is angular momentum in.....orbit of He^+
(1) First (2) Second
(3) Third (4) Infinite

AS0201

5. Which element contain non-spherical electron density :-
(1) He (2) B
(3) Be (4) Li

AS0202

6. First shell energy of He^+ ion is –54.4 eV. Then energy of its second shell is :-
(1) –54.4 eV (2) –13.6 eV
(3) –27.2 eV (4) +27.2 eV

AS0203

7. If ℓ = 2 and n = 3 for any atom then maximum number of electron is :-
(1) 2 (2) 6
(3) 12 (4) 10

AS0204

8. A metal in its dipositive state has the electronic configuration 2, 8, 14 and has the atomic weight equal to 56. Number of neutrons in its nucleus would be :-
(1) 30 (2) 32 (3) 34 (4) 28

AS0205

9. The quantum numbers +1/2 and –1/2 for the electron spin represent.
(1) Rotation of the electron in clockwise and anticlockwise direction respectively.
(2) Rotation of the electron in anticlockwise and clockwise direction respectively.
(3) Magnetic moment of the electron pointing up and down respectively.
(4) Two quantum mechanical spin states which have no classical analogue.

AS0207

10. Uncertainty in position of a 0.25 g particle is 10^{-5} m. Then uncertainty in its velocity will be:-
(h = 6.6×10^{-34} Js) :-
(1) 1.2×10^{34} m/s (2) 2.1×10^{-26} m/s
(3) 1.6×10^{-20} m/s (4) 1.7×10^{-9} m/s

AS0208

11. The wavelength of radiation emitted when an electron in a hydrogen atom makes a transition from an energy level with n = 3 to a level with n = 2 is : [Given that $E_n = \frac{-1312}{n^2}$ kJ mol^{-1}]
(1) 6.56×10^{-7} m (2) 65.6 nm
(3) 65.6×10^{-7} m (4) any of the above

AS0209

12. Electronic energy of hydrogen atom depends on the quantum number :
(1) n, ℓ and m (2) n and ℓ only
(3) n and m only (4) n only

AS0210

13. A gas absorbs a photon of 355 nm and emits at two wavelengths. If one of the emissions is at 680 nm, the other is at :-
(1) 743 nm (2) 518 nm
(3) 1035 nm (4) 325 nm

AS0212

14. The frequency of light emitted for the transition n = 4 to n = 2 of He^+ is equal to the transition in H atom corresponding to which of the following :-

(1) n = 3 to n = 1 (2) n = 2 to n = 1

(3) n = 3 to n = 2 (4) n = 4 to n = 3

AS0213

15. The electrons identified by quantum numbers n and ℓ :-

(a) n = 4 , ℓ = 1 (b) n = 4, ℓ = 0

(c) n = 3, ℓ = 2 (d) n = 3, ℓ = 1

Can be placed in order of increasing energy as:-

(1) (a) < (c) < (b) < (d) (2) (c) < (d) < (b) < (a)

(3) (d) < (b) < (c) < (a) (4) (b) < (d) < (a) < (c)

AS0214

16. Energy of an electron is given by $E = -2.178 \times 10^{-18}\ J \left(\frac{Z^2}{n^2}\right)$. Wavelength of light required to excite an electron in an hydrogen atom from level n = 1 to n = 2 will be :-

(h = 6.62×10^{-34} Js and c = 3.0×10^8 ms^{-1})

(1) 1.214×10^{-7} m (2) 2.816×10^{-7} m

(3) 6.500×10^{-7} m (4) 8.500×10^{-7} m

AS0215

17. A certain negative ion X^{-2} has 18 neutrons in its nucleus and 18 electrons in its extra nuclear structure. What is the mass number of the most abundant isotope of 'X' :-

(1) 35.46 (2) 32 (3) 36 (4) 39

AS0216

18. A single electron orbits a stationary nucleus of charge +Ze, where Z is a constant. It requires 47.2 eV to excite electron from second Bohr orbit to third Bohr orbit, find the value of Z :-

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

AS0219

19. A photon of energy 12.75 eV is completely absorbed by a hydrogen atom initially in ground state. The principal quantum number of the excited state is :-

(1) 1 (2) 3 (3) 4 (4) ∞

AS0220

20. An hydrogen atom (ionisation energy 13.6 eV) jumps from third excited state to first excited state. The energy of photon emitted in the process is :-

(1) 1.89 eV (2) 2.55 eV

(3) 12.09 eV (4) 12.75 eV

AS0221

21. If a photon of energy 14 eV is incident on an H-atom, what is true :-

(1) Atom will be ionised and electron will have a kinetic energy of 14 eV

(2) Atom will be ionised and electron will have a kinetic energy of 0.4 eV

(3) Photon passes through atom without interacting with it

(4) More than one electrons will make transitions

AS0222

22. An electron of energy 10.8 eV is incident on an H-atom then :-

(1) The electron will come out with 10.8 eV energy.

(2) The electron will be completely absorbed

(3) 10.2 eV. of the electron would be absorbed by H atom and it would come out with 0.6 eV energy.

(4) Can't be predicted

AS0223

23. The ratio of the difference in energy between the first and second Bohr orbit to that between second and third Bohr orbit in H-atom is :-

(1) 4/9 (2) 1/3 (3) 27/5 (4) 1/2

AS0224

24. Match the following :-

(A) Energy of ground state of He^+	(i) +6.04 eV
(B) Potential energy of I orbit of H–atom	(ii) –27.2 eV
(C) Kinetic energy of II excited state of He^+	(iii) 8.72×10^{-18}J
(D) Ionisation potential of He^+	(iv) –54.4 eV

(1) A – (i), B – (ii), C – (iii), D – (iv)

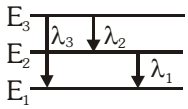
(2) A – (iv), B – (iii), C – (ii), D – (i)

(3) A – (iv), B – (ii), C – (i), D – (iii)

(4) A – (ii), B – (iii), C – (i), D – (iv)

AS0225

25. In the following transition which statement is correct



(1) $E_{3-1} = E_{3-2} - E_{2-1}$
(2) $\lambda_3 = \lambda_1 + \lambda_2$
(3) $\nu_3 = \nu_2 + \nu_1$
(4) All of these

AS0226

26. In which transition, one quantum of energy is emitted :-

(1) $n = 4 \rightarrow n = 2$ (2) $n = 3 \rightarrow n = 1$
(3) $n = 4 \rightarrow n = 1$ (4) All of them

AS0227

27. When a hydrogen sample in ground state is bombarded then what potential is required to accelerate electron so that first Paschen line is emitted :-

(1) 2.55 V (2) 0.65 V
(3) 12.09 V (4) 12.75 V

AS0228

28. The binding energy of electron in ground state of hydrogen atom is 13.6 eV. The energies required to eject out an electron from three lowest states of He^+ will be – (in eV)

(1) 13.6, 10.2, 3.4 (2) 13.6, 3.4, 1.5
(3) 13.6, 27.2, 40.8 (4) 54.4, 13.6, 6

AS0229

29. The transition of electron in H–atom that will emit maximum energy is :–

(1) $n_3 \rightarrow n_2$
(2) $n_4 \rightarrow n_3$
(3) $n_5 \rightarrow n_4$
(4) All have same energy

AS0230

30. Given that in the H– atom the transition energy for n = 1 to n = 2 Rydberg states is 10.2eV. The energy for the same transition in Be^{3+} is :-

(1) 20.4 eV (2) 163.2 eV
(3) 30.6 eV (4) 40.8 eV

AS0231

31. When a electron in H– atom jumps from n = 4 to n = 1, ultra violet light is emitted. If the transition corresponds to n = 4 to n = 2 then which of the following colours will be emitted :-

(1) Ultra violet (2) Green
(3) Infra red (4) No colour

AS0232

32. The wavelength of first line of the Lyman series for hydrogen is 1216 Å. The wavelength for the first line of this series for a 10 time ionised sodium atom (Z = 11) will be :-

(1) 1000 A° (2) 100 A°
(3) 10 A° (4) 1 A°

AS0233

33. For the azimuthal quantum number (ℓ), the total number of magnetic quantum number is given by :-

(1) $\ell = \frac{(m+1)}{2}$ (2) $\ell = \frac{(m-1)}{2}$
(3) $\ell = \frac{(2m+1)}{2}$ (4) $\ell = \frac{(2m-1)}{2}$

AS0235

34. In P-atom find out the no. of paired electrons for ℓ= 1 and m = 0 :-

(1) 3 (2) 1
(3) 2 (4) 0

AS0236

35. When the value of principal quantum number n is 3, the permitted value of azimuthal quantum numbers ℓ and magnetic quantum numbers 'm' are:-

(1)

ℓ	**m**
0	0
1	+1, 0, –1
2	+2, +1, 0, –1, –2

(2)

ℓ	**m**
0	1
2	+2, 1, –2
3	+3, +3, +2, 1, –2, –3

(3)

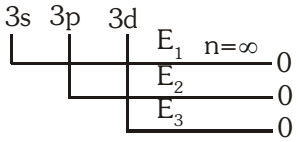
ℓ	**m**
0	0
1	1,2, 3, 2, 0, 1, 2
2	+3, +2, 1, –2, –3

(4)

ℓ	**m**
1	0, 1
2	0, 1, 2
3	0, 1, 2, 3

AS0237

36. For H atom, the energy required for the removal of electron from various sub-shells is given as under:-



The order of the energies would be :-

(1) $E_1 > E_2 > E_3$ (2) $E_3 > E_2 > E_1$

(3) $E_1 = E_2 = E_3$ (4) None of these

AS0240

37. If uncertainty in position and momentum are equal, then uncertainty in velocity is ?

(1) $\sqrt{\frac{h}{\pi}}$ (2) $\frac{1}{2m}\sqrt{\frac{h}{\pi}}$

(3) $\sqrt{\frac{h}{2\pi}}$ (4) $\frac{1}{m}\sqrt{\frac{h}{\pi}}$

AS0154

38. The measurement of the electron's position is associated with an uncertainty in momentum, which is equal to 1×10^{-18} g cm s^{-1}. The uncertainty in electron velocity is :

(mass of electron = 9×10^{-28}g)

(1) 1×10^{11} cm s^{-1} (2) 1×10^{9} cm s^{-1}

(3) 1×10^{6} cm s^{-1} (4) 1×10^{5} cm s^{-1}

AS0155

39. Electromagnetic radiation of wavelength 248.4 nm is just sufficient to ionise the sodium atom. The ionisation energy of sodium in KJ mol^{-1} is :

(1) 462 (2) 473 (3) 481 (4) 493

AS0270

40. An element with mass number 81 contains 31.7% more neutrons as compared to protons. The atomic symbol is :

(1) $_{30}X^{81}$ (2) $_{35}X^{81}$

(3) $_{40}X^{81}$ (4) $_{60}X^{81}$

AS0271

41. Line spectra observed in the case of multielectron atom can be explained by :

(1) Four quantum numbers

(2) Three quantum numbers

(3) Only two quantum numbers

(4) Only one quantum number

AS0272

42. n = 3, l = 1, m = 0 is an orbital in :

(1) 's' subshell of second shell

(2) 's' subshell of third shell

(3) 'p' subshell of second shell

(4) 'p' subshell of third shell

AS0273

EXERCISE-III (Analytical Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**2**	**2**	**4**	**1**	**2**	**2**	**4**	**1**	**4**	**2**	**1**	**4**	**1**	**2**	**3**
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	**1**	**2**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**4**	**4**	**4**	**1**	**2**
Que.	31	32	33	34	35	36	37	38	39	40	41	42			
Ans.	**2**	**3**	**2**	**3**	**1**	**3**	**2**	**2**	**3**	**2**	**1**	**4**			