Q.51 Given below are the quantum numbers for 4 electrons

(A) n = 3, l = 2, m_l = 1, m_s = +1/2

(B) n = 4, l = 1, m_l = 0, m_s = +1/2

(C) n = 4, l = 2, m_l = -2, m_s = -1/2

(D) n = 3, l = 1, m_l = -1, m_s = +1/2

The correct order of increasing energy is

(1) D < B < A < C (2) D < A < B < C

(3) B < D < A < C (4) B < D < C < A

Q.52 Which of the following sets of quantum numbers is not allowed

(1) n = 3, l = 2, m_l = 0, s = + ½

(2) n = 3, l = 2, m_l = -2, s = + ½

(3) n = 3, l = 3, m_l = -3, s = - ½

(4) n = 3, l = 0, m_l = 0, s = - ½

Q.53 Given below are two statements. One is labelled as Assertion A and the other is labelled as Reason R.

Assertion A: Energy of 2s orbital of hydrogen atom is greater than that of 2s orbital of lithium.

Reason R: Energies of the orbitals in the same subshell decrease with increase in the atomic number.

In the light of the above statements, choose the correct answer from the options given below

(1) Both Assertion and Reason are true and Reason is the correct explanation of Assertion

(2) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion

(3) Assertion is true but Reason is false

(4) Assertion is false but Reason is true

Q.54 Identify the incorrect statement from the following

(1) A circular path around the nucleus in which an electron moves is proposed as Bohr's orbit

(2) An orbital is the one electron wave function (Ψ) in an atom

(3) The existence of Bohr's orbits is supported by hydrogen spectrum

(4) Atomic orbital is characterized by the quantum numbers n and l only

Q.55 The number of s-electrons present in an ion with 55 protons in its unipositive state is

(1) 8 (2) 9

(3) 12 (4) 10

Q.56 The radius of the 2nd orbit of Li^{2+} is x. The expected radius of the 3rd orbit of Be^{3+} is

(1) $\frac{9}{4}x$ (2) $\frac{4}{9}x$

(3) $\frac{27}{16}x$ (4) $\frac{16}{27}x$

Q.57 Given below are two statements

Statement I: Bohr's theory accounts for the stability and line spectrum of Li^+ ion.

Statement II: Bohr's theory was unable to explain the splitting of spectral lines in the presence of a magnetic field.

Rough Space

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

(1) Both statement I and statement II are true

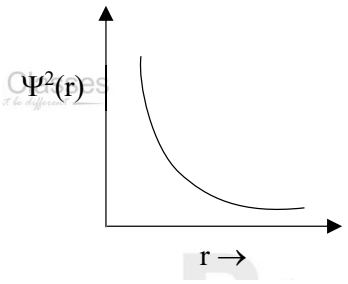
(2) Statement I is false but statement II is true

(3) Both statement I and statement II are false

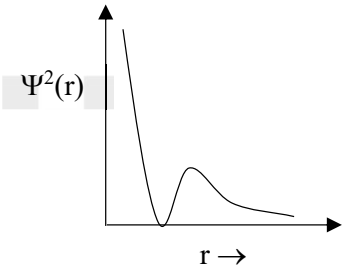
(4) Statement I is true but statement II is false

Q.58 Which of the following is the correct plot for the probability density $\Psi^2(r)$ as a function of distance 'r' of the electron form the nucleus for 2s orbital

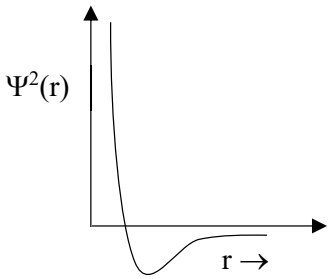
(1)



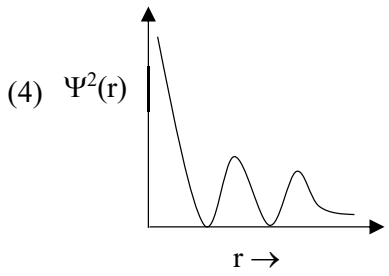
(2)



(3)



(4)



Q.59 Consider the following pairs of electrons

(A) (a) n = 3, l = 1, m_l = 1, m_s = + ½

(b) n = 3, l = 2, m_l = 1, m_s = + ½

(B) (a) n = 3, l = 2, m_l = -2, m_s = - ½

(b) n = 3, l = 2, m_l = -1, m_s = - ½

(C) (a) n = 4, l = 2, m_l = 2, m_s = + ½

(b) n = 3, l = 2, m_l = 2, m_s = + ½

The pairs of electron present in degenerate orbitals is/are

(1) Only A (2) Only B

(3) Only C (4) B and C

Q.60 The energy of one mole of photons of radiation of wavelength 300nm is

(Given: h = 6.63×10^{-34} Js, $N_A = 6.02 \times 10^{23}$ mol^{-1}, c = 3×10^8 ms^{-1})

(1) 235 kJ mol^{-1} (2) 325 kJ mol^{-1}

(3) 399 kJ mol^{-1} (4) 435 kJ mol^{-1}

Q.61 Consider the following statements:

(A) The principal quantum number 'n' is a positive integer with values of 'n'= 1, 2, 3, ...

(B) The azimuthal quantum number 'l' for a given 'n' (principal quantum number) can have values as 'l'= 0, 1, 2, ... n

(C) Magnetic orbital quantum number 'm_l' for a particular 'l' (azimuthal quantum number) has ($2l$ + 1) values

(D) ± 1/2 are the two possible orientations of electron spin

(E) For l = 5, there will be a total of 9 orbital

Rough Space

How many of the above statements are correct

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

Q.62 The de Broglie wavelength of an electron in the 4th Bohr orbit is

(1) $8\pi a_0$ (2) $2\pi a_0$
(3) $4\pi a_0$ (4) $6\pi a_0$

Q.63 The ground state energy of hydrogen atom is -13.6 eV. The energy of second excited state of He^+ ion in eV is

(1) -6.04 (2) -27.2
(3) -54.4 (4) -3.4

Q.64 The kinetic energy of an electron in the second Bohr orbit of a hydrogen atom is [a_0 is Bohr radius]

(1) $\frac{h^2}{4\pi^2 m a_0^2}$ (2) $\frac{h^2}{16\pi^2 m a_0^2}$
(3) $\frac{h^2}{32\pi^2 m a_0^2}$ (4) $\frac{h^2}{64\pi^2 m a_0^2}$

Q.65 Which of the following orbitals will have zero probability of finding the electron in the yz plane

(1) P_x (2) P_y
(3) P_z (4) d_{yz}

Q.66 The ionization energy of hydrogen atom is -13.6 eV. The energy required to excite the electron in a hydrogen atom from the ground state to the first excited state is (Avogadro's constant = 6.022×10^{23})

(1) 1.64×10^{-20} J (2) 1.64×10^{-18} J
(3) 1.64×10^{23} J (4) 1.64×10^{25} J

Q.67 Which law represents the pairing of electron in a sub-shell after each orbital is filled with one electron

(1) Pauli's exclusion principle
(2) Hund's rule
(3) Heisenberg's principle
(4) Hess's law

Q.68 The total magnetic quantum numbers for d-orbital is given by

(1) 2 (2) 0, ± 1, ± 2
(3) 0, 1, 2 (4) 5

Q.69 An electron having the quantum numbers n = 4, l = 3, m = 0, s = - ½ would be in the orbital

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

Q.70 Consider the ground state of (Z = 24). The numbers of electrons with the azimuthal quantum numbers, l = 1 and 2 are respectively

(1) 16 and 4 (2) 12 and 5
(3) 12 and 4 (4) 16 and 5

Q.71 The correct order of increasing energy of atomic orbitals is

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

Q.72 The five d-orbitals are designated as d_{xy}, d_{yz}, d_{xz}, $d_{x^2-y^2}$ and d_{z^2}. Choose the correct statement

(1) The shapes of the first three orbitals are similar but that of the fourth and fifth orbitals are different
(2) The shapes of all five d-orbitals are similar
(3) The shapes of the first four orbitals are similar but that of the fifth orbital is different

Rough Space

(4) The shapes of all five d-orbitals are different

Q.73 Principal, azimuthal and magnetic quantum numbers are respectively related to
(1) Size, shape and orientation
(2) Shape, size and orientation
(3) Size, orientation and shape
(4) None of the above

Q.74 The uncertainty in the position of an electron (mass = 9.1×10^{-28} g) moving with a velocity of 3.0×10^{4} cm s^{-1} accurate upto 0.001% will be
(Use $\frac{h}{4\pi}$ in the uncertainty expression, where h = 6.626×10^{-27} erg-s)
(1) 1.92 cm (2) 7.68 cm
(3) 5.76 cm (4) 3.84 cm

Q.75 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

Q.76 The kinetic energy of one electron is 2.8×10^{-13} J. What is the de-Broglie wavelength
(1) 9.25×10^{-13} m (2) 9.25×10^{-16} m
(3) 9.25×10^{-8} m (4) 18.5×10^{-13} m

Q.77 If electron, hydrogen, helium and neon nuclei are all moving with the velocity of light, then the wavelengths associated with these particles are in the order
(1) Electron > hydrogen > helium > neon
(2) Electron > helium > hydrogen > neon
(3) Electron < hydrogen < helium < neon
(4) Neon < hydrogen < helium < electron

Q.78 **Assertion:** A spectral line will be seen for a $2p_x$ - $2p_y$ transition.
Reason: Energy is released in the form of wave of light when the electron drops from $2p_x$ - $2p_y$ orbital.
(1) If both assertion and reason are true and the reason is the correct explanation of the assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of the assertion.
(3) If assertion is true but reason is false.
(4) If the assertion and reason both are false.

Q.79 Which of the following transitions have minimum wavelength
(1) $n_4 \rightarrow n_1$ (2) $n_2 \rightarrow n_1$
(3) $n_4 \rightarrow n_2$ (4) $n_3 \rightarrow n_1$

Q.80 The hydride ions (H^-) are isoelectronic with
(1) Li (2) He^+
(3) He (4) Be

Q.81 A 100 watt bulb emits monochromatic light of wavelength 400 nm. Calculate the number of photons emitted per second by the bulb.
(1) 3×10^{20} s^{-1} (2) 2×10^{-20} s^{-1}
(3) 2×10^{20} s^{-1} (4) 1×10^{-20} s^{-1}

Q.82 Bohr's theory can also be applied to the ions like
(1) He^+ (2) Li^{2+}
(3) Be^{3+} (4) all of these

Rough Space

Q.83 Which of the following configurations does not follow Hund's rule of maximum multiplicity?

(1) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^2$

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

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

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

Q.84 Which of the following properties of atom could be explained correctly by Thomson model of atom?

(1) Overall neutrality of atom.

(2) Spectra of hydrogen atom.

(3) Position of electrons, protons and neutrons in atom.

(4) Stability of atom.

Q.85 **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.

(1) If Both Assertion and Reason are true and Reason is the correct explanation of Assertion

(2) If Both Assertion and Reason are true but Reason is not the correct explanation of Assertion

(3) If Assertion is true but Reason is false

(4) If both Assertion and Reason are false

Q.86 Maximum number of electrons that can be accommodated in shell with n = 4 are

(1) 16 (2) 32

(3) 50 (4) 72

Q.87 Given below are two statements: One is labelled as Assertion A and the other is labelled as Reason R.

Assertion A: Zero orbital overlap is an out of phase overlap.

Reason R: It result due to different orientation / direction of approach of orbitals.

In the light of the above statements. Choose the correct answer from the options given below

(1) Both Assertion and Reason are true and Reason is the correct explanation of Assertion

(2) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion

(3) Assertion is true but Reason is false

(4) Assertion is false but Reason is true

Q.88 If the radius of the 3rd Bohr's orbit of hydrogen atom is r_3 and the radius of 4th Bohr's orbit is r_4. Then

(1) $r_4 = \frac{9}{16} r_3$ (2) $r_4 = \frac{16}{9} r_3$

(3) $r_4 = \frac{3}{4} r_3$ (4) $r_4 = \frac{4}{3} r_3$

Rough Space

Q.89 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, $c = 3.0\times10^{8}$ ms^{-1}]

(1) 219.2 m (2) 2192 m
(3) 21.92 m (4) 219.3 m

Q.90 The orbital angular momentum of an electron in 2s orbital is

(1) $+\frac{1}{2}.\frac{h}{2\pi}$ (2) Zero
(3) $\frac{h}{2\pi}$ (4) $\sqrt{2}.\frac{h}{2\pi}$

Q.91 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

Q.92 Which is not in accordance to Aufbau principle

(1)	1↓	1↓	1	1
	2s	2p		
(2)	1↓	1↓	1↓	1
	2s	2p		
(3)	1	1↓	1	1
	2s	2p		
(4)	1↓	1	1	1
	2s	2p		

Q.93 For sodium atom the number of electrons with m = 0 will be

(1) 2 (2) 7
(3) 9 (4) 8

Q.94 Which of the following orbital is not possible

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

Q.95 There is no difference between a 2p and a 3p orbital regarding

(1) Shape (2) Size
(3) Energy (4) Value of n

Q.96 Compare the energies of two radiations E_1 with wavelength 800 nm and E_2 with wavelength 400 nm.

(1) $E_1 = 2E_2$
(2) $E_1 = E_2$
(3) $E_2 = 2E_1$
(4) $E_2 = -\frac{1}{2} E_1$

Q.97 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?

(1) Visible, Balmer
(2) Ultraviolet, Lyman
(3) Infrared, Paschen
(4) Infrared, Brackett

Q.98 Match the column I with column II and mark the appropriate choice.

Rough Space

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

(1) (A) →(iii), (B) →(iv), (C) →(i), (D) →(ii)
(2) (A) →(ii), (B) →(i), (C) →(iv), (D) →(iii)
(3) (A) →(iv), (B) →(iii), (C) →(i), (D) →(ii)
(4) (A) →(i), (B) →(ii), (C) →(iv), (D) →(iii)

Q.99 Which of the following statements about the electron is incorrect?
(1) It is a negatively charged particle.
(2) The mass of electron is equal to the mass of neutron.
(3) It is a basic constituent of all atoms.
(4) It is a constituent of cathode rays.

Q.100 **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.
(1) If Both Assertion and Reason are true and Reason is the correct explanation of Assertion
(2) If Both Assertion and Reason are true but Reason is not the correct explanation of Assertion
(3) If Assertion is true but Reason is false
(4) If both Assertion and Reason are false

Rough Space