## 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
**CAS001**

**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
**CAS002**

**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) $^{14}_{6}C$, $^{14}_{7}N$, $^{19}_{9}F$
**CAS003**

**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
**CAS004**

**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
**CAS005**

**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 $N^{-3}$, $O^{-2}$, $Cr^{+3}$
**CAS006**

**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
**CAS007**

**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
**CAS008**

**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
**CAS009**

**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
**CAS010**

**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
**CAS011**

**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
**CAS012**

**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

**CAS013**

**14.** Atoms $^{13}_{6}C$ and $^{17}_{8}O$ are related to each other as:-

(1) Isotones (2) Isoelectronic
(3) Isodiaphers (4) Isosters

**CAS014**

**15.** The e/m ratio is maximum for :-

(1) $D^+$ (2) $He^+$
(3) $H^+$ (4) $He^{2+}$

**CAS015**

**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)

**CAS016**

**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

**CAS017**

**18.** The value of planck's constant is $6.63 \times 10^{-34}$ Js. The velocity of light is $3.0 \times 10^8$ m $s^{-1}$. Which value is closest to the wavelength in metres of a quantum of light with frequency of $8 \times 10^{15}$ $s^{-1}$ ?

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

**CAS018**

**19.** The energy of one mole photons of radiation having frequency $5.01 \times 10^{14}$ Hz is :

(1) 160 KJ $mol^{-1}$
(2) 180 KJ $mol^{-1}$
(3) 200 KJ $mol^{-1}$
(4) 220 KJ $mol^{-1}$

**CAS019**

## BOHR'S ATOMIC MODEL

**20.** Angular momentum in second Bohr orbit of H-atom is x. Then find out angular momentum in $I^{st}$ excited state of $Li^{+2}$ ion :

(1) 3x (2) 9x (3) $\frac{x}{2}$ (4) x

**CAS020**

**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

**CAS021**

**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

**CAS022**

**23.** In Bohr's atomic model radius of $I^{st}$ orbit of Hydrogen is 0.053 nm then radius of $3^{rd}$ orbit of $Li^{+2}$ is :

(1) 0.159 nm (2) 0.053 nm
(3) 0.023 nm (4) 0.026 nm

**CAS023**

**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

**CAS024**

**25.** For $Li^{+2}$ ion, $r_2 : r_5$ will be :-

(1) 9 : 25 (2) 4 : 25 (3) 25 : 4 (4) 25 : 9

**CAS025**

**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

**CAS026**

**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) $(2.188 \times 10^6)$ $Kms^{-1}$
(4) $(2.188 \times 10^3)$ $Kms^{-1}$

**CAS027**

**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
**CAS028**

**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
**CAS029**

**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
**CAS030**

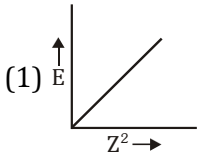
**31.** The energy of H–atom in $n^{th}$ orbit is $E_n$, then energy in $n^{th}$ orbit of singly ionised helium ion will be:-
(1) $4E_n$ (2) $E_n/4$ (3) $2E_n$ (4) $E_n/2$
**CAS031**

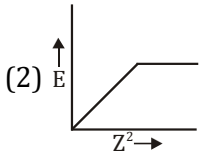
**32.** The energy of second Bohr orbit of the hydrogen atom is –328 kJ/mol. Hence the energy of fourth Bohr orbit should be :
(1) –41 kJ/mol (2) –1312 kJ/mol
(3) –164 kJ/mol (4) –82 kJ/mol
**CAS032**

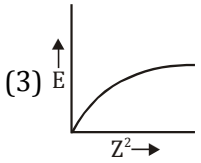
**33.** In a hydrogen atom, if energy of an electron in ground state is –13.6 eV, then energy in the $2^{nd}$ excited state is :-
(1) –1.51 eV (2) –3.4 eV
(3) –6.04 eV (4) –13.6 eV
**CAS033**

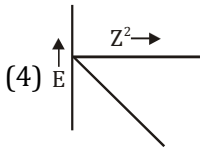
**34.** The ratio between kinetic energy and the total energy of the electron of hydrogen atom according to Bohr's model is :-
(1) 2 : 1 (2) 1 : 1 (3) 1 : –1 (4) 1 : 2
**CAS034**

**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
**CAS035**

**36.** The graphical representation of energy of electron and atomic number is :-
(1) 

(2) 

(3) 

(4) 

**CAS036**

**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
**CAS037**

**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
**CAS038**

**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
**CAS039**

**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
**CAS040**

**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) $4^{th}$
**CAS041**

**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
**CAS042**

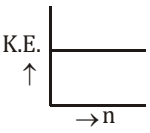
**43.** The ratio of energies of hydrogen atom for first and second excited state is :-
(1) 4/1 (2) 1/4 (3) 4/9 (4) 9/4
**CAS043**

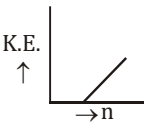
**44.** $E_n = -313.6/n^2$. If the value of $E_n = -34.84$ then to which of the following values does 'n' correspond :-
(1) 1 (2) 2 (3) 3 (4) 4
**CAS044**

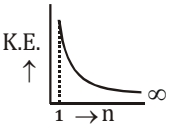
**45.** The ratio of potential energy and total energy of an electron in a Bohr orbit of hydrogen like species is :-
(1) 2 (2) –2 (3) 1 (4) –1
**CAS045**

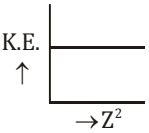
**46.** Which is not a correct order of energy for 1st, 2nd & 3rd orbit :-
(1) $E_1 > E_2 > E_3$
(2) $(PE)_1 < (PE)_2 < (PE)_3$
(3) $(KE)_1 > (KE)_2 > (KE)_3$
(4) '1' & '3' both
**CAS046**

**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) $(E_2 - E_1) = 1/4\ (E_3 - E_2) = 1/9\ (E_4 - E_3)$
**CAS047**

**48.** Which of the following is a correct graph :-
(1) 

(2) 

(3) 

(4) 

**CAS048**

**49.** First excitation potential of H atom is :
(1) 10.2 eV (2) 3.4 eV
(3) 1.51 eV (4) – 3.4 eV
**CAS049**

**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
**CAS050**

**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
**CAS051**

**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
**CAS052**

**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
**CAS053**

**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
**CAS054**

## SPECTRUM AND SPECTRAL LINES

**55.** The spectrum of He is expected to be similar to that of :-
(1) H (2) Na (3) $He^+$ (4) $Li^+$
**CAS055**

**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
**CAS056**

**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) $n_4 \rightarrow n_3$
**CAS057**

**58.** Which series have highest energy in hydrogen spectrum :-
(1) Balmer (2) Brackett
(3) Pfund (4) Lyman
**CAS058**

**59.** The ratio of minimum frequency of Lyman & Balmer series will be :–
(1) 1.25 (2) 0.25 (3) 5.4 (4) 10
**CAS059**

**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
**CAS060**

**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
**CAS061**

**62.** The ratio of minimum wavelengths of Lyman & Balmer series will be :–
(1) 1.25 (2) 0.25 (3) 5 (4) 10
**CAS062**

**63.** The wavelength of photon obtained by electron transition between two levels in H–atom and singly ionised He are $\lambda_1$ and $\lambda_2$ respectively, then :-
(1) $\lambda_2 = \lambda_1$ (2) $\lambda_2 = 2\lambda_1$
(3) $\lambda_2 = \lambda_1/2$ (4) $\lambda_2 = \lambda_1/4$
**CAS063**

**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
**CAS064**

**65.** The ratio of wavelengths of first line of Lyman series in $Li^{+2}$ and first line of Lyman series in deuterium $\left({}_1^2H\right)$ is :-
(1) 1 : 9 (2) 9 : 1 (3) 1 : 4 (4) 4 : 1
**CAS065**

**66.** In an electronic transition, atom cannot emit :-
(1) Visible light (2) $\gamma$ - rays
(3) Infra red light (4) Ultra violet light
**CAS066**

**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) $Be^{3+}$
**CAS067**

**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) $-8.22 \times 10^{14}\ sec^{-1}$
**CAS068**

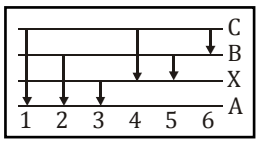
**69.** The first emission line in the H–atom spectrum in the Balmer series will have wave number :-
(1) $\frac{5R}{36}\ cm^{-1}$ (2) $\frac{3R}{4}\ cm^{-1}$
(3) $\frac{7R}{144}\ cm^{-1}$ (4) $\frac{9R}{400}\ cm^{-1}$
**CAS069**

**70.** What transition in $He^{+}$ will have the same $\lambda$ 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) $n = 4 \rightarrow n = 2$
**CAS070**

**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
**CAS071**

**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)
**CAS072**

**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

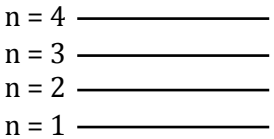
**CAS073**

**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

**CAS074**

**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

**CAS075**

**76.** In the above problem, the number of absorption lines could be :-

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

**CAS076**

**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

**CAS077**

**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

**CAS078**

## de-BROGLIE CONCEPT AND HEISENBERG'S UNCERTAINTY PRINCIPLE

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

(1) $9.28 \times 10^{-24}$ m (2) $9.28 \times 10^{-7}$ m
(3) $9.28 \times 10^{-8}$ m (4) $9.28 \times 10^{-10}$ m

**CAS079**

**80.** What is the de-Broglie wavelength associated with the hydrogen electron in its third orbit :-

(1) $9.96 \times 10^{-10}$ cm (2) $9.96 \times 10^{-8}$ cm
(3) $9.96 \times 10^{4}$ cm (4) $9.96 \times 10^{8}$ cm

**CAS080**

**81.** 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 nm
(3) 16 Å (4) 16 nm

**CAS081**

**82.** Number of waves in fourth orbit is :–

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

**CAS082**

**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

**CAS083**

**84.** For a valid Bohr orbit, its circumference should be

(1) = n λ (2) = (n – 1)λ
(3) > n λ (4) < n λ

**CAS084**

**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

**CAS085**

**86.** The uncertainty in position of an electron & helium atom are same. If the uncertainty in momentum for the electron is $32 \times 10^5$ g cm $s^{-1}$, then the uncertainty in momentum of helium atom will be

(1) $32 \times 10^5$ g cm $s^{-1}$ (2) $16 \times 10^5$ g cm $s^{-1}$
(3) $8 \times 10^5$ g cm $s^{-1}$ (4) None of these

**CAS086**

**87.** Calculate the uncertainty in the position of an electron (mass $9.1 \times 10^{-28}$g) moving with a velocity of $3 \times 10^4$ cm $sec^{-1}$, if the uncertainty in velocity is 0.011% ?
(1) 1.92 cm (2) 7.68 cm
(3) 0.175 cm (4) 4.84 cm
**CAS087**

**88.** Heisenberg Uncertainty principle is not valid for
(1) Moving electron (2) Motor car
(3) Stationary particles (4) 2 & 3 both
**CAS088**

**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 $6.6252 \times 10^{-27}$ erg second ?
(1) $6.6252 \times 10^{-19}$ gcm/s
(2) $6.6252 \times 10^{-21}$ gcm/s
(3) $6.6252 \times 10^{-24}$ gcm/s
(4) $6.6252 \times 10^{--27}$ gcm/s
**CAS089**

**90.** Which of the following has least de-Broglie wavelength, moving with same speed ?
(1) $e^-$ (2) p (3) $CO_2$ (4) $SO_2$
**CAS090**

## QUANTUM NUMBERS

**91.** The following quantum no. are possible for how many orbitals n = 3, $\ell$ = 2, m = +2 ?
(1) 1 (2) 2 (3) 3 (4) 4
**CAS091**

**92.** Number of possible orbitals (all types) in n = 3 energy level is :-
(1) 1 (2) 3 (3) 4 (4) 9
**CAS092**

**93.** Which sub–shell is not permissible :–
(1) 2d (2) 4f (3) 6p (4) 3s
**CAS093**

**94.** Nodal plane is found in which orbital :-
(1) n = 2, $\ell$ = 0 (2) n = 3, $\ell$ = 0
(3) n = 2, $\ell$ = 1 (4) n = 1, $\ell$ = 0
**CAS094**

**95.** No. of nodal surface in 2s orbital :-
(1) 0 (2) 1 (3) 2 (4) 3
**CAS095**

**96.** Number of orbitals in h sub-shell is
(1) 11 (2) 15 (3) 17 (4) 19
**CAS096**

**97.** How many quantum numbers are required to specify the position of electron :-
(1) 1 (2) 2 (3) 3 (4) 4
**CAS097**

**98.** Which of the following is correct for a 4d–electron
(1) n = 4, $\ell$ = 2, s = + $\frac{1}{2}$
(2) n = 4, $\ell$ = 2, s = 0
(3) n = 4, $\ell$ = 3, s = 0
(4) n = 4, $\ell$ = 3, s = + $\frac{1}{2}$
**CAS098**

**99.** If n = 3, then which value of '$\ell$' is correct :–
(1) 0 (2) 1
(3) 2 (4) All of them
**CAS099**

**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
**CAS100**

**101.** Which statement is not correct for n = 5, m = 2 :-
(1) $\ell$ = 4
(2) $\ell$ = 0, 1,2,3 ; s = + 1/2
(3) $\ell$= 3
(4) $\ell$= 2, 3, 4
**CAS101**

**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
**CAS102**

**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
**CAS103**

**104.** The total number of value of m for the electrons in n = 4 is -
(1) 4 (2) 8 (3) 16 (4) 32
**CAS104**

**105.** In an atom, for how many electrons, the quantum numbers will be n = 3, $\ell$ = 2, m = + 2, s = + $\frac{1}{2}$ :-
(1) 18 (2) 6 (3) 24 (4) 1
**CAS105**

**106.** Which orbital is represented by the complete wave function $\psi_{420}$ :-
(1) $4d_{z^2}$ (2) $3d_{z^2}$
(3) $4p_z$ (4) 4s
**CAS106**

**107.** An electron is in one of 4d orbital. Which of the following quantum number value is not possible :-
(1) n = 4 (2) $\ell$ = 1
(3) m = 1 (4) m = 2
**CAS107**

**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
**CAS108**

**109.** If $\ell$ = 3 then type and number of orbital is :–
(1) 3p, 3 (2) 4f, 14
(3) 5f, 7 (4) 3d, 5
**CAS109**

**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
**CAS110**

**111.** n, $\ell$ and m values of an electron in $3p_y$ orbital are :-
(1) n = 3 ; $\ell$ = 1 and m = 1
(2) n = 3 ; $\ell$ = 1 and m = –1
(3) Both 1 and 2 are correct
(4) None of these
**CAS111**

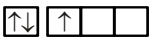
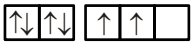
**112.** The maximum probability of finding an electron in the $d_{xy}$ orbital is :-
(1) Along the x-axis
(2) Along the y-axis
(3) At an angle of 45° from the x and y axis
(4) At an angle of 90° from the x and y axis
**CAS112**

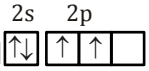
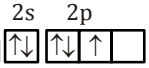
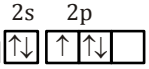
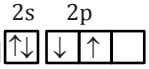
**113.** Which orbital has two angular nodal planes :-
(1) s (2) p (3) d (4) f
**CAS113**

**114.** An orbital with $\ell$ = 0 is symmetrical about the:-
(1) x-axis only (2) y-axis only
(3) z-axis only (4) nucleus
**CAS114**

**115.** If n & $\ell$ 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) $\sum_{\ell=0}^{\ell=n-1} 2(2\ell+1)$
**CAS115**

## RULES FOR FILLING OF ORBITALS

**116.** Which configuration does not obey Pauli's exclusion principle :-
(1)  (2) 
(3)  (4) 
**CAS116**

**117.** Which of the following configuration follows the Hund's rule :–
(1) [He]  (2) [He] 
(3) [He]  (4) [He] 
**CAS117**

**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

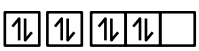
**CAS118**

**119.** The orbital with maximum energy is :-
(1) 3d (2) 5p (3) 4s (4) 6d

**CAS119**

**120.** No. of all subshells having $n + \ell = 7$ is:-
(1) 4 (2) 5 (3) 6 (4) 7

**CAS120**

**121.** Electronic configuration 
has violated :–
(1) Hund's rule (2) Pauli's principle
(3) Aufbau principle (4) $(n + \ell)$ rule

**CAS121**

**122.** The total spin resulting from a $d^9$ configuration is:-
(1) $\frac{1}{2}$ (2) 2 (3) 1 (4) $\frac{3}{2}$

**CAS122**

**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

**CAS123**

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

**CAS124**

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

**CAS125**

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

| | **n** | **$\ell$** | **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 |

**CAS126**

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

**CAS127**

**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

**CAS128**

**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

**CAS129**

**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

**CAS130**

**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

**CAS131**

**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

**CAS132**

**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

**CAS133**

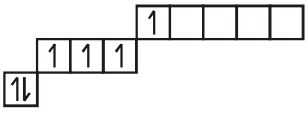
**134.** The atomic number of the element having maximum number of unpaired 3p electrons is (in ground state):-

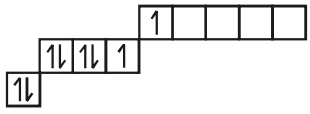
(1) 15 (2) 10

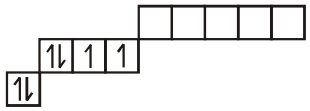
(3) 12 (4) 8

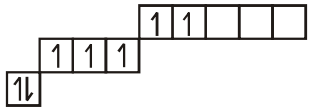
**CAS134**

**135.** Which one represent ground state configuration :-

(1) 

(2) 

(3) 

(4) 

**CAS135**

**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

**CAS136**

## EXERCISE-I (Conceptual Questions) ANSWER KEY

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

## Exercise - II (Previous Year Questions) AIPMT/NEET

### AIPMT 2014

**1.** What is the maximum number of orbitals that can be identified with the following quantum numbers. n = 3, $\ell$ = 1, $m_\ell$ = 0 ?

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

**CAS150**

**2.** 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 × $10^{-18}$

**CAS151**

**3.** 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) $Mn^{2+}$

**CAS152**

### AIPMT 2015

**4.** 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) $CO_3^{2-}, SO_3^{2-}$

**CAS153**

**5.** 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)

**CAS154**

**6.** 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) $Ni^{2+}$

**CAS155**

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

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

**CAS156**

### RE-AIPMT 2015

**8.** 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

**CAS157**

### NEET-I 2016

**9.** 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

**CAS158**

### NEET-II 2016

**10.** 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) $d_{xz}, d_{yz}$

**CAS159**

**11.** How many electrons can fit in the orbital for which n = 3 and $\ell$ = 1 ?

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

**CAS160**

### NEET(UG) 2017

**12.** 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

**CAS161**

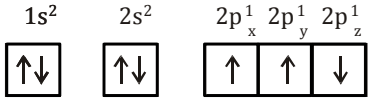
### NEET(UG) 2018

**13.** 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




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

**CAS162**

**NEET(UG) 2019**

**14.** 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
**CAS163**

**Odisha NEET(UG) 2019**

**15.** Orbital having 3 angular nodes and 3 total nodes is :-
(1) 5 p (2) 3 d (3) 4 f (4) 6 d
**CAS164**

**16.** 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
**CAS165**

**NEET (UG) 2020**

**17.** 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
**CAS166**

**NEET (UG) 2020 (Covid-19)**

**18.** 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
**CAS167**

**NEET (UG) 2021**

**19.** 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
**CAS168**

**NEET (UG) 2022**

**20.** Identify the **incorrect** statement from the following.
(1) All the five 4d orbitals have shapes similar to the respective 3d orbitals.
(2) In an atom, all the five 3d orbitals are equal in energy in free state.
(3) The shapes of $d_{xy}$, $d_{yz}$, and $d_{zx}$ orbitals are similar to each other; and $d_{x^2-y^2}$ and $d_{z^2}$ are similar to each other.
(4) All the five 5d orbitals are different in size when compared to the respective 4d orbitals
**CAS169**

**21.** 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
**CAS170**

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

| | **List-I (quantum number)** | | **List-II (Orbital)** |
|---|---|---|---|
| (a) | n = 2, $\ell$ = 1 | (i) | 2 s |
| (b) | n = 3, $\ell$ = 2 | (ii) | 3 s |
| (c) | n = 3, $\ell$ = 0 | (iii) | 2 p |
| (d) | n = 2, $\ell$ = 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)
**CAS171**

**23.** When electromagnetic radiation of wavelength 300 nm falls on the surface of a metal, electrons are emitted with the kinetic energy of $1.68 \times 10^5$ 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) $2.31 \times 10^6$ J mol$^{-1}$ (2) $3.84 \times 10^4$ J mol$^{-1}$
(3) $3.84 \times 10^{-19}$ J mol$^{-1}$ (4) $2.31 \times 10^5$ J mol$^{-1}$
**CAS172**

**NEET (UG) 2023**

**24.** Select the **correct** Statements from the following:
(A) Atoms of all elements are composed of two fundamental particles.
(B) The mass of the electron is $9.10939 \times 10^{-31}$ kg.
(C) All the isotopes of a given elements show same chemical properties.
(D) Protons and electrons are collectively known as nucleons.
(E) Dalton's atomic theory, regarded the atom as an ultimate particle of matter.
Choose the **correct** answer from the options given below.
(1) C, D and E only (2) A and E only
(3) B,C and E only (4) A,B and C only
**CAS193**

**25.** The relation between $n_m$, ($n_m$ = the number of permissible values of magnetic quantum number (m)) for a given value of azimuthal quantum number ($l$), is

(1) $l = 2n_m + 1$ (2) $n_m = 2l^2 + 1$

(3) $n_m = l + 2$ (4) $l = \frac{n_m - 1}{2}$

**CAS194**

**NEET (UG) 2024**

**26.** Match List I with List II.

| List I Quantum Number | List II Information provided |
|---|---|
| A. $m_\ell$ | I. shape of orbital |
| B. $m_s$ | II. size of orbital |
| C. $\ell$ | III. orientation of orbital |
| D. $n$ | IV. orientation of spin of electron |

Choose the correct answer from the options given below :

(1) A-I, B-III, C-II, D-IV (2) A-III, B-IV, C-I, D-II

(3) A-III, B-IV, C-II, D-I (4) A-II, B-I, C-IV, D-III

**CAS227**

**27.** The energy of an electron in the ground state (n = 1) for $He^+$ ion is –xJ, then that for an electron in n = 2 state for $Be^{3+}$ ion in J is :

(1) – x (2) $-\frac{x}{9}$ (3) –4x (4) $-\frac{4}{9}x$

**CAS228**

**NEET (UG) 2024 (Re-examination)**

**28.** The quantum numbers of four electrons are given below :

I. n = 4, $\ell$ = 2, $m_\ell$ = –2, s = $-\frac{1}{2}$

II. n = 3, $\ell$ = 2, $m_\ell$ = 1, s = $+\frac{1}{2}$

III. n = 4, $\ell$ = 1, $m_\ell$ = 0, s = $+\frac{1}{2}$

IV. n = 3, $\ell$ = 1, $m_\ell$ = –1, s = $+\frac{1}{2}$

The **correct** decreasing order of energy of these electrons is :

(1) IV > II > III > I (2) I > III > II > IV

(3) III > I > II > IV (4) I > II > III > IV

**CAS229**

**29.** Given below are two statements :

**Statement-I :** The Balmer spectral line for H atom with lowest energy is located at $\frac{5}{36}R_H cm^{-1}$

($R_H$ = Rydberg constant)

**Statement-II :** When the temperature of blackbody increases, the maxima of the curve (intensity vs wavelength) shifts to shorter wavelength.

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

(1) Statement I is true but Statement II is false

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

(3) Both Statement I and Statement II are true

(4) Both Statement I and Statement II are false

**CAS230**

## EXERCISE-II (Previous Year Questions) ANSWER KEY

| Question | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Answer | 1 | 4 | 2 | 3 | 1 | 4 | 4 | 2 | 4 | 1 | 3 | 3 | 3 | 2 | 3 |
| Question | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | |
| Answer | 2 | 2 | 1 | 1 | 3 | 4 | 4 | 4 | 3 | 4 | 2 | 1 | 2 | 3 | |

## Exercise - III (Analytical Questions) Master Your Understanding

**1.** Given below are two statements:
**Statement I :** Azimuthal quantum number '$\ell$' identifies the subshell and determines the shape of orbital.
**Statement II :** There are $(2\ell+1)$ orbitals of each type in a subshell.
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 correct.
(2) Statement I is correct but statement II is incorrect
(3) Statement I is incorrect but statement II is correct.
(4) Both statements I and statements II are incorrect.

**CAS173**

**2.** Given below are two statements:
**Statement I :** Two electrons can have the same value of three quantum numbers n, l and m in same atom.
**Statement II :** No two electrons in an atom can have, the same set of four quantum numbers.
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 correct.
(2) Statement I is correct but statement II is incorrect
(3) Statement I is incorrect but statement II is correct.
(4) Both statements I and statements II are incorrect.

**CAS174**

**3.** Given below are two statements:
**Statement I :** The energy of 3d orbital is greater than 4p orbital.
**Statement II :** If two orbital have the same value of $(n+\ell)$, the orbital with lower value of n will have the lower energy.
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 correct.
(2) Statement I is correct but statement II is incorrect
(3) Statement I is incorrect but statement II is correct.
(4) Both statements I and statements II are incorrect.

**CAS177**

**4.** Given below are two statements:
**Statement I :** Energy of stationary state of an electron is $E_n = R_H\left(\frac{-1}{n^2}\right)$.
**Statement II :** When the electron present in $n^{th}$ orbit is attracted by nucleus then its energy is less compare to when it is present at infinite distance.
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 correct.
(2) Statement I is correct but statement II is incorrect
(3) Statement I is incorrect but statement II is correct.
(4) Both statements I and statements II are incorrect.

**CAS178**

**5.** True statements for Cathode Ray are
(a) Travel in straight line in absence of electric or magnetic field.
(b) Characteristics depend upon the material of electrodes of tube.
(c) Characteristics does not depend upon the nature of gas present in cathode ray tube.
(1) a, c (2) a, b (3) b, c (4) a, b, c

**CAS181**

**6.** According to Thomson model of atom :
(a) Negative charge is uniformly distributed in an atom.
(b) Atom possesses spherical shape.
(c) Mass of the atom is assumed to be uniformly distributed over the atom.
(d) Overall neutrality of atom cannot be explained.
(1) b, c (2) b, c, d (3) a, b, c (4) a, c, d

**CAS182**

**7.** For an electrically neutral atom, choose correct statement -
(a) Number of electron is equal to number of proton.
(b) Number of electron is equal to number of neutron.
(c) Positive charge of the nucleus is due to protons.
(d) Mass of nucleus is due to proton, neutrons and electrons.
(1) a and c (2) a, c, d (3) b, d (4) a, b, c

**CAS183**

**8.** Match the Column – I and Column - II

| Column - I | | Column - II | |
|---|---|---|---|
| (a) | all s orbitals have | (p) | The minimum value of principal quantum number is 3 |
| (b) | for $\ell = 2$ | (q) | different from other d-orbitals |
| (c) | Shape of $d_{z^2}$ is | (r) | extra stability is associated |
| (d) | with completely and half filled subshells | (s) | Probability of finding the electron at a given distance is equal in all directions. |

(1) (a) – (s), (b) – (p), (c) – (q), (d) – (r)
(2) (a) – (p), (b) – (r), (c) – (s), (d) – (q)
(3) (a) – (q), (b) – (p), (c) – (s), (d) – (r)
(4) (a) – (p), (b) – (q), (c) – (r), (d) – (s)

**CAS188**

**9.** Given below are two statements; one is labelled as **Assertion (A)** and the other is labelled as **Reason(R)** .
**Assertion (A) :** In hydrogen atom, energy of 4s is more than 3d.
**Reason (R) :** An orbital with lower value of $(n + \ell)$ has smaller energy than the orbital with higher value of $(n + \ell)$.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A).**
(2) **(A)** is correct but **(R)** is not correct.
(3) **(A)** is not correct but **(R)** is correct.
(4) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A).**

**CAS189**

**10.** Given below are two statements; one is labelled as **Assertion (A)** and the other is labelled as **Reason(R)** .
**Assertion (A) :** p orbital has dumb-bell shape.
**Reason (R) :** Electrons present in p-orbital can have one of three value for 'm'.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A).**
(2) **(A)** is correct but **(R)** is not correct.
(3) **(A)** is not correct but **(R)** is correct.
(4) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A).**

**CAS190**

**11.** Given below are two statements; one is labelled as **Assertion (A)** and the other is labelled as **Reason(R)** .
**Assertion (A) :** No two electrons in an atom can have the same value of four quantum numbers
**Reason (R) :** No two electrons in an atom can be simultaneously in the same shell, same subshell same orbitals and have same spin.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A).**
(2) **(A)** is correct but **(R)** is not correct.
(3) **(A)** is not correct but **(R)** is correct.
(4) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A).**

**CAS192**

## EXERCISE-III (Analytical Questions) ANSWER KEY

| Question | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Answer | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 4 |