Miscellaneous Exercise Question Bank

1. An α – particle having kinetic energy 5 MeV falls on a Cu-foil. The shortest distance from the nucleus of Cu to which α – particle reaches is (atomic no. of Cu = 29, K = 9×10^9 Nm^2 / C^2)

(A) $2.35 \times 10^{-13} m$ **(B)** $1.67 \times 10^{-14} m$
(C) $5.98 \times 10^{-15} m$ **(D)** None of these

2. For a 3s-orbital value of Ψ is given by following relation:

$$\Psi(3s) = \frac{1}{9\sqrt{3}}\left(\frac{1}{a_0}\right)^{3/2}(6 - 6\sigma + \sigma^2)e^{-\sigma/2}; \text{where } \sigma = \frac{2r.Z}{3\alpha_0}$$

What is the maximum radial distance of node from nucleus?

(A) $\frac{(3+\sqrt{3})\alpha_0}{Z}$ **(B)** $\frac{\alpha_0}{Z}$ **(C)** $\frac{3}{2}\frac{(3+\sqrt{3})\alpha_0}{Z}$ **(D)** $\frac{2\alpha_0}{Z}$

3. Monochromatic radiation of specific wavelength is incident on H-atoms in ground state. H-atoms absorb energy and emit subsequently radiations of six different wavelength. Find wavelength of incident radiations:

(A) 9.75 nm **(B)** 50 nm **(C)** 85.8 nm **(D)** 97.25 nm

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

(A) $\frac{\lambda}{2}$ **(B)** λ **(C)** 2λ **(D)** 3λ

5. Calculate the minimum and maximum number of electrons which may have magnetic quantum number, m = + 1 and spin quantum number, $s = -\frac{1}{2}$ in chromium (Cr):

(A) 0, 1 **(B)** 1, 2 **(C)** 4, 6 **(D)** 2, 3

6. An electron in a hydrogen atom in its ground state absorbs 1.5 times as much energy as the minimum required for it to escape from the atom. What is the velocity of the emitted electron?

(A) 1.54×10^6 m/s **(B)** 1.54×10^8 m/s
(C) 1.54×10^3 m/s **(D)** 1.54×10^4 m/s

7. Which have the same number of s-electrons as the d-electrons in Fe^{2+}?

(A) Li **(B)** Na **(C)** N **(D)** P

8. Hund's rule deals with the distribution of electrons in:

(A) a quantum shell **(B)** an orbit
(C) an orbital **(D)** degenerate orbitals

9. Which one of the following orbitals is nearest to the nucleus?

(A) 4f **(B)** 5d **(C)** 6s **(D)** 7p

10. If a certain metal was irradiated by using two different light radiations of frequency 'x' and '$2x$', the maximum kinetic energy of the ejected electrons are 'y' and '3y' respectively. The threshold frequency of the metal will be:

(A) $x/3$ **(B)** $x/2$ **(C)** $3x/2$ **(D)** $2x/3$

11. A hydrogen atom in a state having a binding energy of 0.85 eV makes a transition to a state having excitation energy from ground state is 10.2 eV. The energy of the emitted photon is:

(A) 2 .55 eV **(B)** 5.1 eV **(C)** 3.85 eV **(D)** 12.75 eV

12. Ratio of frequency of revolution of electron in the 2nd excited state of He^+ and 2nd state of hydrogen is:

(A) 32/27 **(B)** 27/32 **(C)** 1/54 **(D)** 27/2

13. The wavelength of the first line of Lyman series for hydrogen is identical to that of the second line of Balmer series for some hydrogen like ion 'X'. The value of energy for 1^{st} excited state for 'X' is:

(A) –54.4 eV **(B)** –32.8 eV **(C)** –13.6 eV **(D)** –3.8 eV

14. If each hydrogen atom in the ground state of 1.0 mol of H-atoms is excited by absorbing photons of energy 8.4eV, 11.09eV and 15.0eV of energy, then the number of spectral lines emitted is equal to:

(A) None **(B)** Two **(C)** Three **(D)** Four

15. Which of the following has the maximum number of unpaired electrons?

(A) Mg^{2+} **(B)** Ti^{3+} **(C)** V^{3+} **(D)** Fe^{2+}

16. Which of the following orbitals will have the maximum number of radial nodes?

(A) 3s **(B)** $4d_{z^2}$ **(C)** $4d_{xy}$ **(D)** $2p_x$

17. A mono chromatic source of light rated at 200 W emits 4×10^{20} photons per second. Find the wavelength of light.

(A) 400 nm **(B)** 800 nm **(C)** 1200 nm **(D)** None of these

18. Three photons coming from excited atomic-hydrogen sample are picked up. Their energies are 12.1 eV, 10.2 eV and 1.9 eV. These photons must come from:

(A) a single atom **(B)** two atoms

(C) three atoms **(D)** either two atoms or three atoms

19. In which of the following transitions will the wavelength be minimum?

(A) n = 5 to n = 4 **(B)** n = 4 to n = 3 **(C)** n = 3 to n = 2 **(D)** n = 2 to n = 1

20. If the excitation energy for the H-like (hypothetical) sample is 24 eV, then binding energy in III excited state is:

(A) 2 eV **(B)** 3 eV **(C)** 4 eV **(D)** 5 eV

21. Given ionisation potential of H atom is 13.6 eV. The frequency of H_β line of Lyman series is:

(A) 2.90×10^{15} Hz **(B)** 3.07×10^{15} Hz

(C) 1.02×10^7 Hz **(D)** 9.7×10^6 Hz

22. Which of the following sets of quantum number(s) is(are) not possible?

	n	**ℓ**	**m_ℓ**	**m_s**		**n**	**ℓ**	**m_ℓ**	**m_s**
(A)	4	2	–2	+1/2	**(B)**	3	0	0	–1/2
(C)	3	2	–3	–1/2	**(D)**	5	3	0	+1/2

23. Which of the following value of angular momentum is not possible.

(A) $2\hbar$ **(B)** $1.5\frac{h}{\pi}$ **(C)** $2.5\hbar$ **(D)** $0.5\frac{h}{\pi}$

24. If the lowest energy X-rays have $\lambda = 3.055 \times 10^{-8}$ m, estimate the minimum difference in energy between two Bohr's orbits such that an electronic transition would correspond to the emission of an X-ray. Assuming that the electrons in other shells exert no influence, at what Z (minimum) would a transition from the second energy level to the first result in the emission of an X-ray?

(A) 1 **(B)** 2 **(C)** 3 **(D)** 4

25. The energy of an electron in the Bohr's first orbit of H-atom is –13.6 eV. The possible energy values of the excited states for electrons in Bohr's orbits of hydrogen is(are):

(A) –3.4 eV **(B)** –4.2 eV **(C)** –6.8 eV **(D)** +6.8 eV

26. Potential energy of electron present in He^+ is:

(A) $\frac{e^2}{2\pi\varepsilon_0 r}$ **(B)** $\frac{3e^2}{4\pi\varepsilon_0 r}$ **(C)** $\frac{-2e^2}{4\pi\varepsilon_0 r}$ **(D)** $\frac{-e^2}{4\pi\varepsilon_0 r^2}$

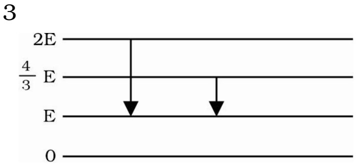
27. A single electron in an ion has ionization energy equal to 217.6 eV. What is the total number of neutrons present in one ion of it?

(A) 2 **(B)** 4 **(C)** 5 **(D)** 9

28. Which of the following has non-spherical electron shell ?

(A) He **(B)** B **(C)** Be **(D)** Li

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



(A) $\frac{\lambda}{3}$ **(B)** $\frac{3\lambda}{4}$ **(C)** $\frac{4\lambda}{3}$ **(D)** 3λ

30. A beam of specific kind of particles of velocity 2.1×10^7 m / s is scattered by a gold (Z = 79) nuclei. Find out specific charge (charge/mass) of this particle if the distance of closest approach is 2.5×10^{-14} m.

(A) 4.84×10^7 C / kg **(B)** 4.84×10^{-7} C / kg

(C) 2.42×10^7 C / kg **(D)** 3×10^{-12} C / kg

31. The energy of separation of an electron in a hydrogen like atom in excited state is 3.4 eV. The de-Broglie wave length (in Å) associated with the electron is:
(Given radius of first orbit of H-atom is 0.53 Å)

(A) 3.33 **(B)** 6.66 **(C)** 13.31 **(D)** None of these

32. The ratio of the radius difference between 4^{th} and 3^{rd} orbit of H-atom and that of Li^{2+} ion is:

(A) 1 : 1 **(B)** 3 : 1 **(C)** 3 : 4 **(D)** 9 : 1

33. The velocity of an electron in excited state of H-atom is 1.093×10^6 m / s. What is the circumference of this orbit?

(A) 3.32×10^{-10} m **(B)** 6.64×10^{-10} m

(C) 13.30×10^{-10} m **(D)** 13.28×10^{-8} m

34. The angular momentum of an electron in a Bohr's orbit of He^+ is 3.1652×10^{-34} kg – m^2 / sec. What is the wave number in terms of Rydberg constant (R) of the spectral line emitted when an electron falls from this level to the first excited state. [Use h = 6.626×10^{-34} J.s]

(A) 3R **(B)** $\frac{5R}{9}$ **(C)** $\frac{3R}{4}$ **(D)** $\frac{8R}{9}$

35. If radiation corresponding to second line of "Balmer series" of Li^{2+} ion, knocked out electron from first excited state of H-atom, then kinetic energy of ejected electron would be:

(A) 2.55 eV **(B)** 4.25 eV **(C)** 11.25 eV **(D)** 19.55 eV

36. When an electron makes a transition from (n + 1) state to nth state, the frequency of emitted radiations is related to n according to (n >> 1):

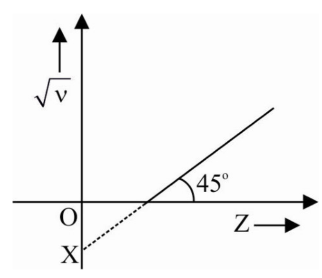
(A) $v = \frac{2cRZ^2}{n^3}$ **(B)** $v = \frac{cRZ^2}{n^4}$

(C) $v = \frac{cRZ^2}{n^2}$ **(D)** $v = \frac{2cRZ^2}{n^2}$

37. In a collection of H-atom, all the electrons jump from n = 5 to ground level finally (directly or indirectly), without emitting any line in Balmer series. The number of possible different radiations is:

(A) 10 **(B)** 8 **(C)** 7 **(D)** 6

38. In the graph between $\sqrt{v}$ and Z for the Mosley's equation $\sqrt{v} = a(Z - b)$, the intercept OX is –1 on $\sqrt{v}$ axis.
What is the frequency when atomic number (Z) is 51 ?



(A) 50 s^{-1} **(B)** 100 s^{-1}

(C) 2500 s^{-1} **(D)** None of these

39. Balmer gave an equation for wavelength of visible region of H-spectrum as $\lambda = \frac{Kn^2}{n^2 - 4}$. Where n = principal quantum number of energy level, K = constant in terms of R (Rydberg constant).
The value of K in terms of R is:

(A) R **(B)** $\frac{R}{2}$ **(C)** $\frac{4}{R}$ **(D)** $\frac{5}{R}$

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

(A) $v = \sqrt{\frac{2(E_p - E)}{m}}$ **(B)** $v = \sqrt{\frac{2(E_p + 9E)}{m}}$

(C) $v = \sqrt{\frac{2(E_p - 9E)}{m}}$ **(D)** $v = \sqrt{\frac{2(E_p - 3E)}{m}}$

41. H-atom is exposed to electromagnetic radiation of $\lambda = 1025.6$ Å and excited atom gives out induced radiations. What is the minimum wavelength of these induced radiations?

(A) 102.6 nm **(B)** 12.09 nm **(C)** 121.6 nm **(D)** 810.8 nm

***42.** When an electron of H-atom jumps from a higher to lower energy state, then:

(A) its potential energy decreases

(B) its kinetic energy increases

(C) its angular momentum remains unchanged

(D) wavelength of de Broglie wave associated with the electron decreases

***43.** In a hydrogen like species, electron is in 2nd excited state. The Binding energy of 4th state of this species is 13.6 eV, then:

(A) A 25 eV photon can set free the electron from the second excited state of this sample

(B) 3 different types of photon will be observed if electron make transition up to ground state from the second excited state

(C) If 23 eV photon is used for electron in 2nd excited state then K.E. of the ejected electron is 1 eV

(D) 2nd line of Balmer series of this sample has same energy value as 1st excitation energy of H-atoms

***44.** Which of the following is(are) proportional to the energy of electromagnetic radiation?

(A) Frequency **(B)** Wave number

(C) Wavelength **(D)** Number of photons

***45.** Which of the following statements is (are) incorrect for an electron of quantum numbers n = 4 and $m = 2$?

(A) The value of ℓ may be 2 **(B)** The value of ℓ may be 3

(C) The value of s may be + 1/2 **(D)** The value of ℓ may be 0, 1, 2, 3.

46. Pick out the orbital with the maximum number of nodal planes?

(A) $3d_{xy}$ **(B)** $3d_{z^2}$ **(C)** $4d_{xy}$ **(D)** $2p_x$

***47.** Which of the following relate to light as wave motion?

(A) diffraction **(B)** interference

(C) photoelectric effect **(D)** $E = mc^2$

***48.** The discovery of Balmer and Lyman series was made before ……………….. proposing model for structure of atom.

(A) Thomson **(B)** Rutherford **(C)** Bohr **(D)** Planck

***49.** The orbitals with identical shape but different orientations are:

(A) s-orbitals **(B)** p-orbitals **(C)** d-orbitals **(D)** f-orbitals

***50.** H^+, D^+, T^+ differ in all except in:

(A) no. of electrons **(B)** no. of neutrons

(C) electronic configuration **(D)** ionic mass

51. The ratio of spin only magnetic moments of Fe^{3+} and Co^{2+} is:

(A) $\sqrt{24} : \sqrt{15}$ **(B)** $7 : 3$ **(C)** $\sqrt{35} : \sqrt{15}$ **(D)** $\sqrt{5} : \sqrt{7}$

***52.** In which of the following conditions the de Broglie wavelength of particle A will less than that of particle $B(m_A > m_B)$?

(A) Linear momentum of these particles are same

(B) Move with same speed

(C) Move with same kinetic energy

(D) Have fallen through same height

***53.** Select the correct statements.

(A) if n and l are principal and azimuthal quantum numbers respectively then the term $\sum_{l=n}^{l=n-1}(2l+1)\times 2$ represents number of electrons in a shell

(B) total number of electrons that can be accommodated in 3d subshell is equal to six

(C) s is non directional

(D) number of orbitals in 4^{th} shell is 16

***54.** Select the correct statements.

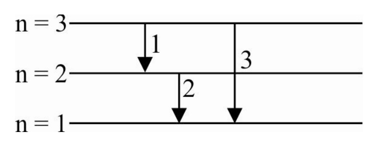
(A) spin quantum number was proposed by Uhlenbeck and Gold-Smith

(B) spin angular momentum is given by $\sqrt{S(S+1)}.\frac{h}{2\pi}$, where S stands for absolute value of spin quantum number i.e., without sign

(C) each fine line of atomic spectrum was found to consist a doublet pair of lines

(D) the five d-orbitals energetically not identical

***55.** Select the correct relationships for the given transitions:



(A) $\lambda_3 = \lambda_1 + \lambda_2$ **(B)** $\nu_3 = \nu_1 + \nu_2$

(C) $\bar{\nu}_3 = \bar{\nu}_1 + \bar{\nu}_2$ **(D)** $\lambda_3 = \frac{\lambda_1 \lambda_2}{\lambda_1 + \lambda_2}$

Paragraph for Question No. 56 - 57

It is impossible to determine simultaneously the position and velocity of small microscopic particle like, electron, proton or neutron with accuracy. This is called Heisenberg's uncertainty principle. Mathematically it is represented as $\Delta x \cdot \Delta p \geq \frac{h}{4\pi}$

Δx is uncertainty in position, Δp is uncertainty in momentum.

56. If uncertainty in the measurement of position and momentum of an electron are equal then uncertainty in the measurement of its velocity is approximately:

(A) 8×10^{12}m/s **(B)** 6×10^{12}m/s **(C)** 4×10^{12}m/s **(D)** 2×10^{12}m/s

57. If a 1.00 g body is travelling along X-axis at 100 cm s^{-1} with uncertainty in velocity 2 cms^{-1}. Then uncertainty in its position is:

(A) 5.28×10^{-30}m **(B)** 2.64×10^{-30}m **(C)** 1.30×10^{-30}m **(D)** 0.66×10^{-30}m

Paragraph for Question No. 58 - 63

The letters *n*, *l* and *m* proposed by Bohr, Sommerfeld and Zeeman respectively for quantisation of angular momentum in classical physics were later on obtained as the results of solution of Schrodinger wave equation based on quantum mechanics. The term *n, l, m* were named as principal quantum number, azimuthal quantum number and magnetic quantum number respectively. The fourth quantum number *i.e.*, spin quantum number, *s* was given by Uhlenback on the basis of two spins of electrons. The first two quantum numbers also decides the nodes of an orbital.

58. The numerical value $\Psi_{4,3,0}$ denotes:

(A) 3d-orbital **(B)** 4f-orbital **(C)** 2s-orbital **(D)** 4d-orbital

59. The orbital angular momentum of 3p-orbitals in terms of $\hbar \left(\hbar = \frac{h}{2\pi} \right)$ is:

(A) $\sqrt{2}\ \hbar$ **(B)** $2\ \hbar$ **(C)** $\frac{\hbar}{\sqrt{2}}$ **(D)** $\frac{\hbar}{2\pi}$

60. Number of radial and angular nodes in 3p-orbitals respectively are:

(A) 1, 1 **(B)** 2, 1 **(C)** 1, 2 **(D)** 2, 2

61. Which statement about energy level in H-atom is correct?

(A) only *n* and *l* decide energy level **(B)** only '*l*' decides energy level

(C) only *n* decides energy level **(D)** *n, l* and *m* decide energy level

62. The energy of an electron of $2p_y$ orbital is :

(A) greater than $2p_x$ orbital **(B)** less than $2p_z$ orbital

(C) equal to 2s orbital **(D)** same as that of $2p_x$ and $2p_z$ orbital

63. Δu_x is uncertainty in velocity of electron and Δx_y is uncertainty in position, then:

(A) $\Delta u_x . \Delta x_y = \frac{h}{4\pi}$ **(B)** $\Delta u_x . \Delta x_y = \frac{h}{4\pi m}$

(C) $\Delta u_x . \Delta x_y \geq h / 4\pi m$ **(D)** none of these

Paragraph for Question No. 64 - 71

Excited atoms emits radiations consisting of only certain discrete frequencies or wavelengths. In spectroscopy it is often more convenient to use frequencies or wave numbers than wavelength because frequencies and wave numbers are proportional to energy and spectroscopy involves transitions between different energy levels. The line spectrum shown by a monoelectronic excited atom (a finger print of an atom) can be given as:

$$\frac{1}{\lambda} = \bar{v} = R_H.Z^2\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$$

Where Z is atomic number of monoelectronic atom or ion and n_1, n_2 are integers and if $n_2 > n_1$, then emission spectrum is noticed and it $n_2 < n_1$, then absorption spectrum is noticed. Every line in spectrum can be represented as a difference of two terms $\frac{R_H.Z^2}{n_1^2}$ and $\frac{R_H.Z^2}{n_2^2}$

64. If E_n and E_m are energy levels of an atom and $E_m > E_n$, then the frequencies in the line spectrum of an atom can be calculated by:

(A) $\frac{c}{h}\left[E_n - E_m\right]$ **(B)** $R_H\left[E_n - E_m\right]$
(C) $\frac{c}{h}\left[E_m - E_n\right]$ **(D)** $\frac{1}{h}\left[E_m - E_n\right]$

65. The ratio of wavelength for II line of Balmer series and I line of Lyman series is:

(A) 1 **(B)** 2 **(C)** 3 **(D)** 4

66. Which series of line spectrum of H-atom is observed usually in both emission and absorption spectrum?

(A) Lyman **(B)** Balmer **(C)** Paschen **(D)** Pfund

67. λ_1 and λ_2 are wavelengths of the first line of Balmer series of deuterium and hydrogen respectively, then:

(A) $\lambda_1 > \lambda_2$ **(B)** $\lambda_1 < \lambda_2$ **(C)** $\lambda_1 = \lambda_2$ **(D)** $\lambda_1 \geq \lambda_2$

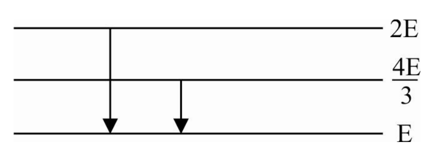
68. A continuum in line spectra represents the state:

(A) when lines become more and more densely spaced
(B) a region of continuous absorption or emission of radiation without any line spectra
(C) the electron becomes completely free from the nucleus and it is no longer restricted to discrete quantized energy states but may take up continuously the kinetic energy of translation corresponding to its speed in free space
(D) all of the above

69. The colour of I line of Balmer series is:

(A) red **(B)** blue **(C)** violet **(D)** green

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



(A) $\frac{\lambda}{3}$ **(B)** $\frac{3\lambda}{4}$ **(C)** $\frac{4\lambda}{3}$ **(D)** 3λ

71. H-atoms in ground state (13.6 eV) are excited by monochromatic radiations of photon of energy 12.1 eV. The number of spectral lines emitted in H-atom will be:

(A) 1 **(B)** 2 **(C)** 3 **(D)** 6

Paragraph for Question No. 72 - 73

For H-like atoms: $E_n = -\frac{Z^2\ Rh}{n^2}; u_n = \frac{u_1 Z}{n}$ and $r_n = \frac{r_1 \times n^2}{Z}$; where R_H is Rydberg constant.

72. The electrons in Li^{2+} ions are excited from ground state by absorbing 8.4375 R_H energy/electron. How much emission lines are expected during de-excitation of electrons to ground state?

(A) 3 **(B)** 2 **(C)** 6 **(D)** 10

73. What is the potential energy of electron in 2nd orbit of H-atom?

(A) $-\frac{R_H}{2}$ **(B)** $-2R_H$ **(C)** $-4R_H$ **(D)** $-R_H$

Column-I and Column-II contains four entries each. Entries of Column-I are to be matched with some entries of Column-II. One or more than one entries of Column-I may have the matching with the same entries of Column-II.

74. Match the column:

	Column-I		**Column-II**
(A)	Electron	**(P)**	Negative charge
(B)	Proton	**(Q)**	Positive charge
(C)	Neutron	**(R)**	$1.6 \times 10^{-19} C$
(D)	Positron	**(S)**	Chargeless

75. Match the column:

	Column-I		**Column-II**
(A)	Thomson model of atom	**(P)**	Electrons are present in extra nuclear region
(B)	Rutherford model of atom	**(Q)**	Electron in the atom is described as wave
(C)	Bohr model of atom	**(R)**	Positive charge is accumulated in the nucleus
(D)	Schrodinger model of hydrogen atom	**(S)**	Uniform sphere of positive charge with embedded electrons

76. Match the column:

	Column-I		**Column-II**
(A)	Atomic theory of matter	**(P)**	Rutherford scattering experiment
(B)	Quantization of charge	**(Q)**	Milliken's oil drop experiment
(C)	Quantization of electronic energy level	**(R)**	Atomic spectra
(D)	Size of nucleus	**(S)**	Law of multiple proportions

77. Match the column:

	Column-I		Column-II
(A)	$\frac{\text{K.E.}}{\text{P.E.}}$	**(P)**	2
(B)	P.E. + 2K.E.	**(Q)**	$-\frac{1}{2}$
(C)	$\frac{\text{P.E.}}{\text{T.E.}}$	**(R)**	-1
(D)	$\frac{\text{K.E.}}{\text{T.E.}}$	**(S)**	0

78. Match the column:

	Column-I		Column-II
(A)	Lyman series	**(P)**	Visible region
(B)	Humphrey series	**(Q)**	Ultraviolet region
(C)	Paschen series	**(R)**	Infrared region
(D)	Balmer series	**(S)**	Far infrared region

79. In case of hydrogen spectrum wave number is given by

$$\bar{v} = R_H\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right] \text{where } n_1 < n_2$$

	Column - I		Column – II
(A)	Lyman series	**(P)**	$n_2 = 2$
(B)	Balmer series	**(Q)**	$n_2 = 3$
(C)	Pfund series	**(R)**	$n_2 = 6$
(D)	Brackett series	**(S)**	$n_2 = 5$

80. Match the column:

	Column-I n = shell		Column-II (Value of l) Subshell
(A)	2^{nd}	**(P)**	1
(B)	3^{rd}	**(Q)**	2
(C)	4^{th}	**(R)**	3
(D)	1^{st}	**(S)**	0

81. Match the column:

	Column-I		Column-II
(A)	The radial node of 5s atomic orbital is	**(P)**	1
(B)	The angular node of $3d_{yz}$ atomic orbital is	**(Q)**	4
(C)	The sum of angular node and radial node of $4d_{xy}$ atomic orbital	**(R)**	2
(D)	The angular node of 3p atomic orbital	**(S)**	3

82. Match the column:

	Column-I		Column-II
(A)	The d-orbital which has two angular nodes	**(P)**	$3d_{x^2-y^2}$
(B)	The d-orbital with two nodal surfaces form cones	**(Q)**	$3d_{z^2}$
(C)	The orbital without angular node	**(R)**	4f
(D)	The orbital which has three angular nodes	**(S)**	3s

83. Match the column:

	Column-I		Column-II
(A)	Orbital angular momentum of an electron	**(P)**	$\sqrt{S(S+1)}\dfrac{h}{2\pi}$
(B)	Angular momentum of an electron in an orbit	**(Q)**	$\sqrt{n(n+2)}$
(C)	Spin angular momentum of an electron	**(R)**	$\dfrac{nh}{2\pi}$
(D)	Magnetic moment of atom	**(S)**	$\sqrt{l(l+1)}\dfrac{h}{2\pi}$

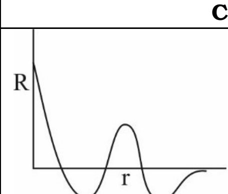
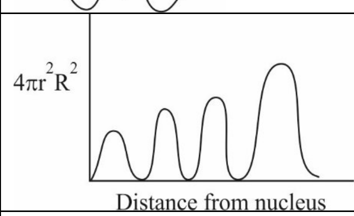
84. Match the column:

	Column-I		Column-II
(A)	Number of orbitals in the nth shell	**(P)**	$2(2l+1)$
(B)	Maximum number of electrons in a subshell	**(Q)**	n
(C)	Number of subshells in n^{th} shell	**(R)**	$2l+1$
(D)	Number of orbitals in a subshell	**(S)**	n^2

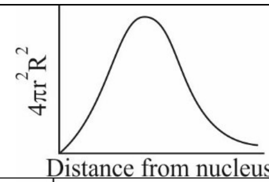
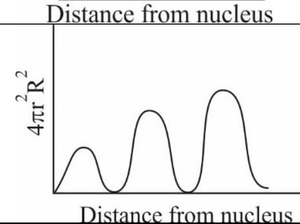
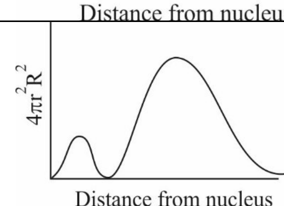
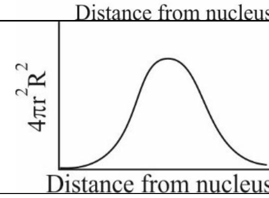
85. Match the column:

	Column-I		Column-II
(A)	2s	**(P)**	$n = 4, l = 2, m = 0$
(B)	$2p_z$	**(Q)**	$n = 4, l = 2, m = -2$ or $+2$
(C)	$4d_{x^2-y^2}$	**(R)**	$n = 2, l = 1, m = 0$
(D)	$4d_{z^2}$	**(S)**	$n = 2, l = 0, m = 0$

86. Match the column:

	Column-I		Column-II
(A)		**(P)**	4s
(B)		**(Q)**	$5p_y$
(C)	Angular probability depends upon θ and ϕ	**(R)**	3s
(D)	Atleast one angular node is present	**(S)**	$6d_{xy}$

87. Match the column:

	Column-I		Column-II
(A)	3s	**(P)**	
(B)	3p	**(Q)**	
(C)	3d	**(R)**	
(D)	2p	**(S)**	

88. Match the entries in Column I with the correctly related quantities in Column II.

Column – I		Colum – II	
(A)	Angular momentum	**1.**	Increases by increasing n
(B)	Kinetic energy	**2.**	Decreases by decreasing Z
(C)	Potential energy	**3.**	Increases by decreasing Z
(D)	Velocity	**4.**	Decreases by decreasing n

Assertion and Reason Type Questions

Each question contains Statement-1 (Assertion) and Statement-2 (Reason).

Examine the statements carefully and mark the correct answer according to the instructions given below:

(A) If both the statement are TRUE and Statement-2 is the correct explanation of Statement-1

(B) If both the statements are TRUE but Statement-2 is NOT the correct explanation of Statement-1

(C) If Statement-1 is TRUE and Statmenet-2 is FALSE

(D) If Statement-1 is FALSE and Statement-12 is TRUE

89. **Statement-1 :** The angular momentum of d-orbital is $\sqrt{6}\frac{h}{2\pi}$

Statement-2 : Angular momentum of electron in orbit is $mvr = \frac{nh}{2\pi}$

90. **Statement-1 :** Angular momentum of the electron in the orbit which has four subshell is $\frac{2h}{\pi}$

Statement-2 : Angular momentum of electron is quantized.

91. **Statement-1 :** Line emission spectra useful in the study of electronic structure.

Statement-2 : Each element has a unique line emission spectrum.

92. **Statement-1 :** Emitted radiation will fall in visible range when an electron jump from n = 4 to n = 2 in H-atom

Statement-2 : Balmer series radiations belong to visible range for hydrogen atom only.

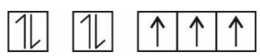
93. **Statement-1 :** Half-filled and fully-filled degenerate orbitals are more stable.

Statement-2 : Extra stability is due to the symmetrical distribution of electrons and exchange energy.

94. **Statement-1 :** The ground state configuration of Cr is $3d^5 4s^1$.

Statement-2 : A set of half-filled orbitals containing one electrons each with their spin parallel provides extra stability.

95. **Statement-1 :** The ground state electronic configuration of nitrogen is



Statement-2 : Electrons are filled in orbitals as per Aufbau principle, Hund's rule of maximum spin multiplicity and Pauli's principle.

96. **Statement-1 :** An orbital cannot have more than two electrons and they must have opposite spins.

Statement-2 : No two electrons in an atom can have same set of all the four quantum numbers as per Pauli's exclusion principle.

97. **Statement-1 :** Orbital having xz plane as node may be $3d_{xy}$.

Statement-2 : $3d_{xy}$ has zero radial node.

98. **Statement-1 :** The kinetic energy of photo-electrons increase with increase in frequency of incident light where $\nu > \nu_0$

Statement-2 : Whenever intensity of light is increased the number of photo-electron ejected always increases.

99. **Statement-1 :** Cu^{2+} is a coloured ion.

Statement-2 : Every ion with unpaired electron is coloured.

100. **Statement-1 :** For n = 3, l may be 0, 1 and 2 and m may be 0; $0, \pm 1; 0, \pm 1$ and ± 2

Statement-2 : For each value of n, there are 0 to (n – 1) possible values of l; and for each value of l, there are 0 to $\pm l$ values of m.