Exercise-1

ONLY ONE OPTION CORRECT TYPE

Section (A) : Cathode rays, Anode rays, Basic definations and Rutherford model

1. Cathode ray are :
(1) stream of electrons (2) stream of α-particles
(3) radiation (4) stream of cations

2. Which of the following statement is wrong about anode rays :
(1) They travel in straight line (2) They produce heating effect
(3) They carry positive charge (4) None of these

3. Which of the following is/are affected by electric field :
(1) Anode rays (2) Cathode rays (3) Both (1) and (2) (4) None of these

4. The e/m ratio for Anode rays :
(1) varies with the element forming the anode in the discharge tube.
(2) varies with the gas in the discharge tube.
(3) is constant.
(4) Both (1) & (2).

5. Millikan's oil drop expriments is used to find -
(1) e/m ratio of an electron (2) Charge of an electron
(3) Mass of an electron (4) Velocity of an electron

6. Match the following :

Column-I	**Column-II**
Sub-atomic particles	**Persons responsible for discovery**
(1) Electron	(p) James Chadwick
(2) Proton	(q) J.J. Thomson
(3) Neutron	(r) Rutherford
(4) Nucleus	(s) Goldstein

(1) (1 - q, 2 - s, 3 - r, 4 - p) (2) (1 - p, 2 - p, 3 - q, 4 - s)
(3) (1 - r, 2 - s, 3 - p, 4 - q) (4) (1 - q, 2 - s, 3 - p, 4 - r)

7. An element having atomic number 25 and atomic weight 55 will have –
(1) 25 protons and 30 neutrons (2) 25 neutrons and 30 protons
(3) 55 protons (4) 55 neutrons

8. Which of the following is isoelectronic with N_2O :
(1) NO (2) N_2O_5 (3) CO_2 (4) CO

9. The charge on the atom having 17 protons, 18 neutrons and 18 electrons is
(1) + 1 (2) – 1 (3) – 2 (4) zero

10. Number of protons, neutrons and electrons in the element $^{281}_{89}Ac$ are respectively :
(1) 89, 231, 89 (2) 89, 89, 242 (3) 89, 142, 89 (4) 89, 192, 89

11. An isotone of $^{16}_{8}O$ is :

(i) $^{17}_{8}O$ (ii) $^{12}_{6}C$ (iii) $^{14}_{6}C$ (iv) $^{32}_{16}S$

(1) (ii & iii) (2) (i & ii) (3) (iii) (4) (ii & iii & iv)

12. Which of the following are isoelectronic with one another ?

(1) Na^+ and Ne (2) K^+ and O (3) Ne and O (4) Na^+ and K^+

13. Rutherford's experiment on scattering of particles showed for the first time that the atom has

(1) Electrons (2) Protons (3) Nucleus (4) Neutrons

14. When atoms are bombarded with alpha particles, only a few in million suffer deflection, others pass out undeflected. This is because

(1) The force of repulsion on the moving alpha particle is small

(2) The force of attraction on the alpha particle to the oppositely charged electrons is very small

(3) There is only one nucleus and large number of electrons

(4) The nucleus occupies much smaller volume compared to the volume of the atom

15. Which of the following elements has maximum density of nucleus :

(1) $_{14}Si^{30}$ (2) $_{15}P^{31}$ (3) $_{8}O^{16}$ (4) All have same density

Section (B) : Nature of Light and photoelectric effects

1. A photon in X region is more energetic than in the visible region ; X is :

(1) IR (2) UV (3) Microwave (4) Radio wave

2. Photon of which light has maximum energy :

(1) red (2) blue (3) violet (4) green

3. The frequency of yellow light having wavelength 600 nm is :

(1) 5.0×10^{14} Hz (2) 2.5×10^{7} Hz (3) 5.0×10^{7} Hz (4) 2.5×10^{14} Hz

4. Wave number of radiations having frequency of 4×10^4 Hz will be :

(1) 1.33×10^{-6} cm^{-1} (2) 1.33×10^{-7} cm^{-1} (3) 9×10^{-11} cm^{-1} (4) 4×10^{-5} cm^{-1}

5. A wavelength of 400 nm of an electromagnetic radiation is not correspond to :

(1) frequency = 7.5×10^{14} Hz (2) wave number = 2.5×10^{6} m^{-1}.

(3) velocity = 3×10^{8} ms^{-1} (4) λ = 40 Å

6. Which one of the following is not the characteristic of Planck's quantum theory of radiation-

(1) The energy is not absorbed or emitted in whole number multiple of quantum.

(2) Radiation is associated with energy.

(3) Radiation energy is not emitted or absorbed continously but in the form of small packets called quanta.

(4) This magnitude of energy associated with a quantum is proportional to the frequency.

7. Wavelength of a photon having an energy of 2 eV. will be :

(1) 6.2×10^{-7} m (2) 6.2×10^{-6} m (3) 6.2×10^{-9} m (4) 6.2×10^{-8} m

8. One quantum is absorbed per gaseous molecule of X_2 for converting it into X atoms. If light absorbed has wave length 1240Å, then bond energy of X_2 will be :

(1) 10 eV/molecule (2) 20 J/mole (3) 48 eV/molecule (4) 184 J/mol

9. The work function for a metal is 4 eV. To eject a photoelectron of zero velocity from the surface of the metal, the wavelength of incident light should be above :
(1) 310 Å (2) 1550 Å (3) 155 Å (4) 3100 Å

10. The energy required to remove an electron from a metal X is 3.31×10^{-20} J. Wavelength/s of light that can not photoeject an electron from metal X is/are
(1) 4 μm (2) 6 μm (3) 7 μm (4) 5 μm

11. Light of wavelength λ falls on metal having work function hc/λ_0. Photoelectric effect will take place only if :
(1) $\lambda \geq \lambda_0$ (2) $\lambda \geq 2\lambda_0$ (3) $\lambda \leq \lambda_0$ (4) $\lambda \leq \lambda_0/2$

12. Cu metal (work function = 4.8 eV) can show photoelectric effect if wavelength of photon is :
(1) λ = 5000 Å (2) λ = 6000 Å (3) λ = 2000 Å (4) λ = 4000 Å

13. Maximum kinetic energy of photoelectron using photon of wavelength 2000Å at Cu metal will be (If work function of Cu is 4.8 eV.) :
(1) 2.4 ev (2) 1.4 ev (3) 1.9 ev (4) 3.4 ev

14. When the frequency of light incident on a metallic plate is doubled, the maximum KE of the emitted photoelectrons will be :
(1) Doubled
(2) Halved
(3) Increased but more than double of the initial maximum KE
(4) Unchanged

15. The number of photoelectrons emitted depends upon :
(1) The intensity of the incident radiation
(2) The frequency of the incident radiation
(3) The product of intensity and frequency of incident radiation
(4) None of these

Section (C) : Bohr's Model

1. The expression for Bohr’s radius of an atom is
(1) $r = \frac{n^2h^2}{4\pi^2me^4z^2}$ (2) $r = \frac{n^2h^2}{4\pi^2me^2z}$ (3) $r = \frac{n^2h^2}{4\pi^2me^2z^2}$ (4) $r = \frac{n^2h^2}{4\pi^2m^2e^2z^2}$

2. Ratio of radii of second and first Bohr orbits of H atom is :
(1) 2 (2) 4 (3) 3 (4) 5

3. The ratio of radii of second orbits of He^+ , Li^{2+} and Be^{3+} is **:**
(1) 1 : 2 : 3 (2) 6 : 4 : 3 (3) 3 : 4 : 6 (4) none of these

4. If r is the radius of first orbit, the radius of n^{th} orbit of H atom is given by -
(1) r n (2) r n^2 (3) r/n (4) r^2 n^2

5. If the speed of electron in second orbit of He^+ is "v", then the speed of electron in first Bohr orbit of hydrogen atom will be :
(1) v/2 (2) 2v (3) v (4) 4v

6. What is the ratio of speeds of electrons in Ist orbit of H-atom to IVth orbit of He^+ ion .
(1) 2 : 1 (2) 8 : 3 (3) 3 : 2 (4) 27 : 5

7. If the radius of I^{st} orbit of hydrogen atom is 0.53 Å then radius of I^{st} orbit of He^+ is :
(1) 1.27 Å (2) 0.265 Å (3) 1.59 Å (4) 0.132 Å

8. Which state of the triply ionized Beryllium (Be^{3+}) has the same orbit radius as that of the ground state of hydrogen atom ?
(1) 1 (2) 2 (3) 3 (4) 4

9. If the velocity of the electron in first orbit of H atom is 2.18×10^6 m/s, what is its value in third orbit ?
(1) 7.27×10^5 m/s (2) 4.36×10^6 m/s (3) 1.24×10^5 m/s (4) 1.09×10^6 m/s

10. The difference in angular momentum associated with the electron in two successive orbits of hydrogen atom is :
(1) h/π (2) $h/2\pi$ (3) $h/2$ (4) $(n - 1)h/2\pi$

11. The angular momentum of an electron in a given orbit is J, Its kinetic energy will be :
(1) $\frac{1}{2}\frac{J^2}{mr^2}$ (2) $\frac{Jv}{r}$ (3) $\frac{J^2}{2m}$ (4) $\frac{J^2}{2\pi}$

12. Angular momentum in 2^{nd} Bohr orbit of H-atom is x. Then angular momentum of electron in I^{st} excited state of Li^{+2} is :
(1) 3x (2) 9x (3) $\frac{x}{2}$ (4) x

14. When an electron drops from a higher energy level to a low energy level, then :
(1) energy is absorbed (2) energy is emitted
(3) atomic number increases (4) atomic number decreases

14. The maximum energy of an electron in an atom will be at :
(1) Nucleus (2) Ground state
(3) First excited state (4) Infinite distance from the nucleus

15. 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

16. 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

17. In hydrogen atom, energy of first excited state is – 3.4 eV. Then, KE of same orbit of hydrogen atom is:
(1) + 3.4 eV (2) + 6.8 eV (3) – 13.6 eV (4) + 13.6 eV

18. Potential energy of electron is – 27.2 eV in 2^{nd} orbit of He^+. Then total energy of electron in first excited state of Hydrogen atom will be :
(1) –3.4 eV (2) –13.6 eV (3) 3.4 eV (4) 13.6 eV

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

20. The ionisation energy for the H-atom is 13.6 eV. Then the required energy in eV to excite the electron it from the ground state to next higher state will be : (in eV)
(1) 3.4 (2) 10.2 (3) 12.1 (4) 1.5

21. The energy of an electron in an excited H-atom is –1.51 eV. Angular momentum of electron in the given orbit will be
(1) $3h/\pi$ (2) $3h/2\pi$ (3) $2h/\pi$ (4) h/π

22. The ionization energy of H-atom is 13.6 eV. The ionization energy of Li^{+2} ion will be :
(1) 54.4 eV (2) 122.4 eV (3) 13.6 eV (4) 27.2 eV

23. If the binding energy of 3^{rd} orbit of a H-like species is 13.6 eV, then the species must be :
(1) Be^{3+} (2) Li^{+} (3) He^{+} (4) None of these

24. In which excited state that a hydrogen atom sample already in ground state can reach when it is bombarded with photons of energy 12.75 eV, will be :
(1) 4 (2) 2 (3) 3 (4) No transition will occur.

25. If the binding energy of first excited state of a hydrogen like sample is 54.4 eV, then determine the atomic number Z of the H-like species :
(1) 1 (2) 2 (3) 3 (4) 4

26. The excitation energy of first excited state of a hydrogen like atom is 40.8 eV. The energy needed to remove the electron from ground state of the ion is :
(1) 54.4 eV (2) 122.4 eV (3) 40.8 eV (4) 13.6 eV

27. Match the following

(1) Energy of ground state of He^{+}	(i) + 6.04 eV
(2) Potential energy of I orbit of H-atom	(ii) –27.2 eV
(3) Kinetic energy of II excited state of He^{+}	(iii) 54.4 V
(4) 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)

Section (D) : Atomic Spectrum

1. The wavelength of a spectral line for an electronic transition is inversly related to :
(1) No. of electrons undergoing transition
(2) The nuclear charge of the atom
(3) The velocity of an electron undergoing transition
(4) The difference in the energy levels involved in the transition

2. Different lines in Lyman series of hydrogen spectrum lie in :
(1) UV (2) Visible (3) IR (4) None of these

3. The spectral lines corresponding to the radiation emitted by an electron jumping from 6th, 5th and 4th orbits to second orbit belong to :
(1) Lyman series (2) Balmer series (3) Paschen series (4) Pfund series

4. 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

5. Which transition emits photon of maximum frequency in hydrogen like species :
(1) 2nd spectral line of Balmer series (2) 2nd spectral line of Paschen series
(3) 5th spectral line of Humphery series (4) 5th spectral line of Lymen series

6. The shortest λ for the Brakett series for H is : (Given R_H = 109678 cm^{-1})
(1) 1459 Å (2) 4052 Å (3) 4052 nm (4) 1459 nm

7. Wavelength of 1st line of Balmer series in hydrogen spectrum is :
(1) 6656 Å (2) 6266 Å (3) 6626 Å (4) 6566 Å

8. When an electron in an excited hydrogen atom jumps 5th orbit to 3rd orbit the spectral line is observed in the ....region and in ....series of the hydrogen spectrum.
(1) Visible, Balmer (2) Visible, Lyman (3) Infrared, Paschen (4) Infrared, Balmer

9. No. of visible lines when an electron returns from 5th orbit to ground state in H spectrum -
(1) 5 (2) 4 (3) 3 (4) 10

10. Maximum number of spectral lines in Lyman series will be if electron makes transistion from nth orbit :
(1) n (2) n – 1 (3) n – 2 (4) n (n + 1)

11. In a isolated H-atom, electron transits from 6th orbit to 2nd orbit maximum number of spectral lines will be
(1) 6 (2) 10 (3) 4 (4) 0

12. The wave number of first line of Balmer series of hydrogen atom is 15200 cm^{-1}. What is the wave number of first line of Balmer series of Li^{2+} ion:
(1) 15200 cm^{-1} (2) 13680000 m^{-1} (3) 76000 cm^{-1} (4) 13680 cm^{-1}

13. Calculate number of possible spectral lines which may be emitted in bracket series in H atom, if electrons present in 9th excited level returns to ground level.
(1) 4 (2) 5 (3) 6 (4) 7

14. Ratio of wavelength of second line of Lyman series to that of series limit of Paschen series of H-atom.
(1) 1/8 (2) 1/9 (3) 8/9 (4) 9/8

Section (E) : de-Broglie concept & Heisenbergs uncertainity principle

1. The de Broglie equation suggests that an electron has
(1) Particle nature (2) Wave nature
(3) Both Particle & wave nature (4) Radiation behaviour

2. The wavelength of a charged particle ________the square root of the potential difference through which it is accelerated :
(1) is inversely proportional to (2) is directly proportional to
(3) is independent of (4) is unrelated with

3. If the kinetic energy of an electron is increased 4 times, the wavelength of the de-Broglie wave associated with it would become :
(1) four times (2) two times (3) half times (4) one fourth times

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

5. The de-broglie wavelength associated with a ball of mass 1 kg having kinetic energy 0.5 J is.
(1) 6.626×10^{-34} m (2) 13.20×10^{-34}m (3) 10.38×10^{-21} m (4) 6.626×10^{-34} Å

6. The speed of a proton is one hundredth of the speed of light in vacuum. What is its de-Broglie of proton wavelength? Assume that one mole of protons has a mass equal to one gram [$h = 6.626 \times 10^{-27}$ erg sec] :
(1) 13.31×10^{-3} Å (2) 1.33×10^{-3} Å (3) 13.13×10^{-2} Å (4) 1.31×10^{-2} Å

7. What possibly can be the ratio of the de Broglie wavelengths for two electrons each having zero initial energy and accelerated through 50 volts and 200 volts ?
(1) 3 : 10 (2) 10 : 3 (3) 1 : 2 (4) 2 : 1

8. A helium molecule is moving with a velocity of 2.40×10^2 ms^{-1} at 300K. The de-Broglie wave length is about
(1) 0.416 nm (2) 0.83 nm (3) 803 Å (4) 8000 Å

9. If wavelength is equal to the distance travelled by the electron in one second, then -
(1) $\lambda = \frac{p}{h}$ (2) $\lambda = \frac{h}{m}$ (3) $\lambda = \sqrt{\frac{h}{p}}$ (4) $\lambda = \sqrt{\frac{h}{m}}$

10. de-Broglie wavelength of electron in second orbit of Li^{2+} ion will be equal to de-Broglie of wavelength of electron in
(1) n = 3 of H-atom (2) n = 4 of C^{5+} ion (3) n = 6 of Be^{3+} ion (4) n = 3 of He^{+} ion

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

12. Select the incorrect relationship among the following :
(1) $\Delta x \times \Delta p \geq \frac{h}{4\pi}$ (2) $\Delta x \times \Delta p \geq \frac{h}{4\pi m}$ (3) $\Delta x \times \Delta V \geq \frac{h}{4\pi m}$ (4) $\Delta E \times \Delta t \geq \frac{h}{4\pi}$

13. It the uncertainity in position of a moving particle is 0 then uncertainity in momentum will be :
(1) 0 (2) 1 (3) ∞ (4) Can not predict

14. The Uncertainity in the momentum of an electron is 1.0×10^{-10} kg m s^{-1} . The Uncertainity in its position will be: ($h = 6.62 \times 10^{-34}$ Js)
(1) 1.05×10^{-28} m (2) 1.05×10^{-26} m (3) 5.27×10^{-25} m (4) 5.25×10^{-28} m

15. What is the minimum uncertainty in position of a proton whose velocity is given by $1.5 \times 10^6 \pm 1500$ m/s
(1) 21 m (2) 21 cm (3) 21 μm (4) 21 pm

Section (F) : Quantum Numbers and Electronic configuration

1. Magnetic quantum number specifies -
(1) Size of orbitals (2) Shape of orbitals
(3) Orientation of orbitals (4) Nuclear stability

2. A p-orbital can accommodate
(1) 4 electrons (2) 6 electrons
(3) 2 electrons with parallel spins (4) 2 electrons with opposite spins

3. A given orbital is labeled by the magnetic quantum number m = –1. This could not be
(1) s - orbital (2) p-orbital (3) d-orbital (4) f-orbital

4. Which of the following represents the correct set of quantum numbers of a 4d electron ?
(1) 4, 3, 2, $+\frac{1}{2}$ (2) 4, 2, 1, 0 (3) 4, 3, – 2, $+\frac{1}{2}$ (4) 4, 2, 1, $-\frac{1}{2}$

5. An orbital containing electron having quantum number n = 4, l = 3, m = 0 and s = $-\frac{1}{2}$ is called
(1) 3s orbital (2) 3p orbital (3) 4d orbital (4) 4f orbital

6. The maximum number of electrons in a subshell is given by the expression
(1) $4l - 2$ (2) $4l + 2$ (3) $2l + 2$ (4) $2n^2$

7. The electrons present in K-shell of the atom will differ in
(1) principal quantum number (2) azimuthal quantum number
(3) magnetic quantum number (4) spin quantum number

8. The maximum number of 3d-electrons that can have s = $-\frac{1}{2}$, are
(1) 10 (2) 3 (3) 5 (4) 7

9. If n and ℓ are respectively the principal and azimuthal quantum numbers, then the expression for calculating the total number of electrons in any orbit is -
(1) $\sum_{\ell=1}^{\ell=n} 2\ (2\ell+1)$ (2) $\sum_{\ell=1}^{\ell=n-1} 2\ (2\ell+1)$ (3) $\sum_{\ell=0}^{\ell=n+1} 2(2\ell+1)$ (4) $\sum_{\ell=0}^{\ell=n-1} 2(2\ell+1)$

10. Number of electrons having ℓ = 1 and m=0 in P-atom in its ground state :
(1) 3 (2) 1 (3) 2 (4) 0

11. Maximum number of electrons that can have n = 3, ℓ = 2, m = +2, s = +½ in an atom are :
(1) 18 (2) 6 (3) 24 (4) 1

12. A correct set of four quantum numbers for unpaired electron in Cl-atom :

	n	l	m	s
(1)	3	2	0	+½
(2)	3	1	0	+½
(3)	3	1	+1	0
(4)	3	0	–1	+½

13. Spin angular momentum for an electron is given as :
(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

14. The orbital angular momentum of an electron in 2s-orbital is -
(1) $\frac{h}{4\pi}$ (2) zero (3) $\frac{h}{2\pi}$ (4) $\sqrt{2}\ \frac{h}{2\pi}$

15. Which of the following set of quantum numbers is permitted
(1) n = 3, l = 2, m = – 2, s = +1/2
(2) n = 3, l = 2, m = – 1, s = 0
(3) n = 2, l = 2, m = +1, s = – 1/2
(4) n = 2, l = 2, m = +1, s = – 1/2

16. Which of the following principles/rules limits the maximum number of electrons in an orbital to two
(1) Aufbau principle
(2) Pauli's exclusion principle
(3) Hund's rule of maximum multiplicity
(4) Heisenberg's uncertainty principle

17. Which is not correct for an electron having n = 5, m = 2 :
(1) $\ell = 4$
(2) $\ell = 0, 1, 2, 3$
(3) $\ell = 3$
(4) $\ell = 2, 3, 4$

18. Which of the following orbital quantum number value is not possible for an electron present in 4d subshell:
(1) n = 4
(2) $\ell = 1$
(3) m = 1
(4) m = 2

19. The atomic number of an element is 17. The number of orbitals containing electron pairs in the valency shell in its ground state are is :
(1) 8
(2) 2
(3) 3
(4) **6**

20. Nitrogen has the electronic configuration $1s^2, 2s^2 2p_x^1 2p_y^1 2p_z^1$ and not $1s^2, 2s^2 2p_x^2 2p_y^1 2p_z^0$ which is determined by
(1) Aufbau's principle
(2) Pauli's exclusion principle
(3) Hund's rule
(4) Uncertainty principle

21. For sodium atom the number of electrons with m = 0 will be :
(1) 2
(2) 7
(3) 9
(4) 8

22. Which of the following ions has the maximum number of unpaired d-electrons?
(1) Zn^{2+}
(2) Fe^{2+}
(3) Ni^{3+}
(4) Cu^{+}

23. The total spin resulting from a d^7 configuration is :
(1) 1
(2) 2
(3) 5/2
(4) 3/2

24. In hydrogen atom, which is incorrect order of their energies.
(1) 1s < 2p
(2) 2p = 2s
(3) 2p > 2s
(4) 2p < 3s

25. For a given subshell let maximum number of electrons with same spin be x and number of possible m_ℓ values be y.
(1) x = 2y
(2) x = y
(3) $\frac{x}{2} = y$
(4) $x = \frac{y}{2}$

26. Ratio of number of unpaired electrons in Fe^{2+} to that of Ti is
(1) 1.2
(2) 3
(3) 2
(4) 4

27. Orbital angular momentum of 2s orbital is
(1) $\frac{h}{2\pi}$
(2) $\frac{\sqrt{2}h}{2\pi}$
(3) $\frac{\sqrt{3}h}{2\pi}$
(4) Zero

Section (G) : Shape of orbitals

1. Which orbital is non-directional

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

2. An orbital with $\ell = 0$ is symmetrical about the :

(1) x-axis only (2) y-axis only (3) z-axis only (4) All

3. Which orbital has two angular nodal planes.

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

4. Which d-orbital does not have four lobes

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

5. The number of radial nodes of 5s atomic orbital are

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

6. The number of angular nodes of $3d_{yz}$ atomic orbital are

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

7. The sum of angular nodes and radial nodes of $4d_{xy}$ atomic orbital are

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

8. The number of angular nodes of 3p atomic orbital are

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

9. $3p_y$ orbital has..........nodal plane :

(1) XY (2) YZ (3) ZX (4) All of these

10. A 3p-orbital has

(1) Two non-spherical nodes (2) Two spherical nodes

(3) One spherical and one non spherical nodes (4) One spherical and two non spherical nodes

11. Which of the following d-orbitals has dough-nut shape ?

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

12. The permissible solution to the schrodinger wave equation gave an ideal of .... quantum number

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

Exercise-2

1. Which is not true with respect to cathode rays :
(1) Cathode rays consist of fast moving electrons.
(2) For production of cathode rays in a discharge tube, the gas filled should be at a low pressure.
(3) For production of cathode rays in a discharge tube, the voltage applied across the electrodes should be high.
(4) None of these

2. (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 – c), (iii – b), (iv – d), (v – a)
(3) (i – a), (ii – d), (iii – b), (iv – c), (v – b) (4) (i – a), (ii – b), (iii – d), (iv – c), (v – a)

3. The ratio of the "e/m" (specific charge) values of a electron and an α-particle is -
(1) 2 : 1 (2) 1 : 1 (3) 1 : 2 (4) None of these

4. An oil drop has 6.4×10^{-19} C charge. The number of electrons in this oil drop are :
(1) 2 (2) 4 (3) 6 (4) 8

5. Atomic radius is of the order of 10^{-8} cm and nuclear radius is of the order of 10^{-13} cm. Calculate what fraction of atom is occupied by nucleus ?
(1) 10^{-20} (2) 10^{-15} (3) 10^{-12} (4) None

6. The radius of nucleus of $^{27}_{13}Al$ is approximetely:
(1) 1.2×10^{-15} m (2) 2.7×10^{-15} m (3) 10.8×10^{-15} m (4) 4×10^{-15} m

7 If the ratio of radius of two different nuclear are in the ratio 2 : 3, then ratio of their mass numbers will be
(1) $\frac{8}{27}$ (2) $\frac{2}{3}$ (3) $\frac{4}{9}$ (4) $\frac{4}{27}$

8. For a broadcasted electromagnetic wave having frequency of 1200 KHz, number of waves that will be formed in 2 km distance are :
(1) 8 (2) 80 (3) 12 (4) 120

9. If 10^{-17}J of light energy is needed by the interior of human eye to see an object. The number of photons of green light (λ = 550 nm) needed to see the object are :
(1) 27 (2) 28 (3) 29 (4) 30

10. How many photons of light having a wavelength of 5000 Å are necessary to provide 1 joule of energy.
(1) 2.8×10^{18} photons (2) 2.5×10^{17} photons (3) 2.5×10^{18} photons (4) 2.6×10^{14} photons

11. A light source of wavelength λ illuminates a metal and ejects photo-electrons with $(K.E.)_{max}$ = 1 eV

Another light source of wavelength $\frac{\lambda}{3}$, ejects photo-electrons from same metal with $(K.E.)_{max}$ = 4eV

Find the value of work function ?

(1) 1 eV (2) 2 eV (3) 0.5 eV (4) None of these

12. A photon of 300 nm is absorbed by a gas and then emits two photons. One photon has a wavelength 400 nm then the wavelength of second photon in nm :

(1) 1200 (2) 1600 (3) 800 (4) 400

13. The ratio of radius of two different orbits in a H-atom is 4 : 9. Then, the ratio of the frequency of revolution of electron in these orbits is :

(1) 2 : 3 (2) 27 : 8 (3) 3 : 2 (4) 8 : 27

14. The ratio of the time period of electrons in 2^{nd} Bohr orbit of He^+ and 4^{th} Bohr orbit of Li^{2+} is.

(1) $\frac{9}{32}$ (2) $\frac{3}{8}$ (3) $\frac{9}{8}$ (4) $\frac{27}{32}$

15. If the ionisation potential of a hydrogen like species is 20V, its I^{st} excitation potential will be :

(1) 5 V (2) 10 V (3) 15 V (4) 20 V

16. The amount of energy required to excite the electron from 3^{rd} to 4^{th} Bohr's orbit in B^{4+} will be :

(1) 4.5 eV (2) 8.53 eV (3) 25 eV (4) 16.53 eV

17. 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

18. The ionization energy of He^+ is 19.6×10^{-18} J $atom^{-1}$. The energy of the first stationary state of Li^{+2} will be:

(1) 84.2×10^{-18} J/atom (2) 44.10×10^{-18} J/atom

(3) 63.2×10^{-18} J/atom (4) 21.2×10^{-18} J/atom

19. Energy required to pull out an electron from 1^{st} orbit of hydrogen atom to infinity is 100 units. The amount of energy needed to pull out the electron from 2nd orbit to infinity is :

(1) 50 units (2) 100 units (3) 25 units (4) Zero

20. If the I excitation potential of a hypothetical H-like atom is 10.2x V, then the value of II excitation energy is about :

(1) 13.6x eV (2) 12.09x eV (3) -10.2x eV (4) 40.5x eV

21. The kinetic energy of the electron present in the ground state of Li^{2+} ion is represented by :

(1) $\frac{3e^2}{8\pi \in_0 r}$ (2) $-\frac{3e^2}{8\pi \in_0 r}$ (3) $\frac{3e^2}{4\pi \in_0 r}$ (4) $-\frac{3e^2}{4\pi \in_0 r}$

22. If the energy of an electron in hydrogen atom is given by expression, $-1312/n^2$ kJ mol^{-1}, then the energy required to excite the electron from ground state to second orbit is

(1) 328 kJ/mol (2) 656 kJ/mol (3) 984 kJ/mol (4) 1312 kJ/mol

23. The frequency of radiation emitted when the electron falls from n = 2 to n = 1 in a hydrogen atom will be ($h = 6.625 \times 10^{-34}$ Js)

(1) $2.46 \times 10^{15} s^{-1}$ (2) $2.00 \times 10^{15} s^{-1}$ (3) $1.54 \times 10^{15} s^{-1}$ (4) $1.03 \times 10^{15} s^{-1}$

24. The kinetic energy of an electron in the 2^{nd} orbit of hydrogen atom is : (a_0 is Bohr radius of 1^{st} orbit)

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

25. If the series limit of wavelength of the Lyman series for the hydrogen atoms is 912Å, then the series limit of wavelength for the Balmer series of the hydrogen atom is :

(1) 912 Å (2) 912 × 2 Å (3) 912 × 4 Å (4) 912/2 Å

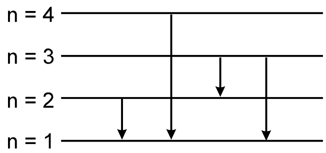
26. The difference between the wave number of 1^{st} line of Balmer series and last line of paschen series for Li^{2+} ion is

(1) $\frac{R}{36}$ (2) $\frac{5R}{36}$ (3) 4R (4) $\frac{R}{4}$

27. If the shortest wave length of Lyman series of H atom is x, then the wave length of the first line of Balmer series of H atom will be -

(1) 9x/5 (2) 36x/5 (3) 5x/9 (4) 5x/36

28. Suppose that a hypothetical atom gives a red, green, blue and violet line spectrum . Which jump according to figure would give off the red spectral line.



(1) $3 \rightarrow 1$ (2) $2 \rightarrow 1$ (3) $4 \rightarrow 1$ (4) $3 \rightarrow 2$

29. What electron transition in the He^+ spectrum would have the same wavelength as the first Lyman transition of hydrogen.

(1) n = 4 to n = 2 (2) n = 6 to n = 4 (3) n = 6 to n = 2 (4) n = 4 to n = 1

30. What will be the KE of photoelectrons ejected, when photon of 13eV is absorbed by H-atom in 3^{rd} excited state.

(1) 12.15 eV (2) 11.49 eV (3) 12.46 eV (4) 12.63 eV

31. What is the ratio of the wave lengths of last lines of Balmer and Lyman series for any hydrogen like species.

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

32. An atom has n energy level then total number of lines in its spectrum are :

(1) 1 + 2 + 3 .... (n + 1) (2) 1 + 2 + 3 .... $(n)^2$

(3) 1 + 2 + 3 .... (n – 1) (4) (n + 1) (n + 2) (n + 4)

33. A certain electronic transition from an excited state to ground state in a sample of H-atoms gives rise to maximum 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

34. What minimum number of atoms/ions should be present in a sample of H-like species, so that a maximum of 6 spectral lines can be produced of electronic transition from fifth excited state upto n = 2 ?

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

35. A particle X moving with a certain velocity has a de Brogile wavelength of 1Å. If particle Y has a mass of 25% that of X and velocity 75% that of X, deBroglies wavelength of Y will be :

(1) 3Å (2) 5.33 Å (3) 6.88 Å (4) 48 Å

36. Number of de Broglie waves formed in the 4th orbit of H are :
(1) 4 (2) 5 (3) 0 (4) 1

37. Calculate the de-Broglie wave length of the electron in the ground state of hydrogen atom , given that its kinetic energy is 13.6 eV - ($1eV = 1.602 \times 10^{-19}J$)
(1) 3.328×10^{-10} m (2) 2.338×10^{-10} m (3) 3.328×10^{10} m (4) 2.338×10m

38. In H-atom, if 'x' is the radius of the first Bohr orbit, de Broglie wavelength of an electron in 3rd orbit is :
(1) $3\pi x$ (2) $6\pi x$ (3) $\frac{9x}{2}$ (4) $\frac{x}{2}$

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

40. A golf ball has a mass of 40 g and a speed of 45 m/s. If the speed can be measured within accuracy of 2%, then uncertainty in position will be approximately :
(1) 10^{-33} m (2) 10^{-40} m (3) 10^{-20} m (4) 10^{-50} m

41. 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

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

43. Magnetic moment of X^{n+} (Z = 26) is $\sqrt{24}$ B.M. Hence number of unpaired electrons and value of n respectively are :
(1) 4, 2 (2) 2, 4 (3) 3, 1 (4) 0, 2

44. For a shell of principal quantum number n = 4 , which is incorrect :
(1) 16 orbitals (2) 4 subshells
(3) maximum 32 electrons (4) $\ell = 0, 1, 2, 3, 4$

45. Which set has the same number of s-electrons
(1) C, Cu^{2+} , Zn (2) Cu^{2+} , Fe^{2+},Ni^{2+} (3) S^{2-} , Ni^{2+},Zn (4) None of these

46. Which electronic configuration does not follow the pauli's exclusion principle
(1) $1s^2, 2s^2 2p^4$ (2) $1s^2, 2s^2 2p^4 3s^2$ (3) $1s^2, 2p^4$ (4) $1s^2, 2s^2 2p^6 3s^3$

47. For a d-electron, the orbital angular momentum is
(1) $\sqrt{6}\hbar$ (2) $\sqrt{2}\hbar$ (3) $\hbar$ (4) $2\hbar$

48. Which of the above statement (s) is/are **false.**

I Orbital angular momentum of the electron having n = 5 and having value of the azimuthal quantum number as lowest for this principle quantum number is $\frac{h}{\pi}$.

II If n = 3, ℓ = 0, m = 0, for the last valence shell electron, then the possible atomic number may be 12 or 13.

III Total spin of electrons for the atom $_{25}Mn$ is $\pm \frac{7}{2}$.

IV Spin magnetic moment of inert gas is 0

(1) I, II and III (2) II and III only (3) I and IV only (4) None of these

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

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

50. Match List-I with List-II and select the correct answer using the codes given below the lists (ℓ and m are respectively the azimuthal and magnetic quantum no.)

List-I	List-II
(1) Number of value of ℓ for an energy level	(1) 0, 1, 2, ... (n - 1)
(2) Value of ℓ for a particular type of orbital	(2) $+\ell$ to $-\ell$ through zero
(3) Number of values of m for ℓ = 2	(3) 5
(4) Value of 'm' for a particular type of orbital	(4) n

Code :

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

51. The orbital angular momentum corresponding to n = 4 and m = –3 is :

(1) 0 (2) $\frac{h}{\sqrt{2}\pi}$ (3) $\frac{\sqrt{6}h}{2\pi}$ (4) $\frac{\sqrt{3}h}{\pi}$

52. A compound of Vanadium has a spin magentic moment 1.73 BM. Work out the electronic configuration of the Vanadium ion in the compound :

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

(3) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^1$ (4) nothing can be said with certainty

53. A neutral atom of an element has 2K, 8L, 9M and 2N electrons. Which of the following is/are incorrectly matched :

(1) Total number of s electrons - 8 (2) Total number of p electrons - 12

(3) Total number of d electrons -1 (4) Number of unpaired electrons in element - 3

54. For an electron, with n = 3 has only one radial node. The orbital angular momentum of the electron will be

(1) 0 (2) $\sqrt{6}\,\frac{h}{2\pi}$ (3) $\sqrt{2}\,\frac{h}{2\pi}$ (4) $3\left(\frac{h}{2\pi}\right)$

55. The maximum probability of finding electron in the d_{xy} orbital is :

(1) Along the x-axis (2) Along the y-axis

(3) At an angle of 45^0 from the x and y axis (4) At an angle of 90^0 from the x and y axis.

Exercise-3

PART - I : NEET / AIPMT QUESTION (PREVIOUS YEARS)

*** Marked Questions are having more than one correct option.**

1. The energy of a photon is 3.03×10^{-19} J, then wavelength of this photon is:
(Given, $h = 6.63 \times 10^{-34}$ Js, $c = 3.00 \times 10^8$ ms^{-1}) **[AIPMT 2000]**
(1) 6.56 nm (2) 65.6 nm (3) 656 nm (4) 0.656 nm

2. Maximum number of orbitals in an atom which can have the quantum numbers n = 3, l = 2, m = + 2 are: **[AIPMT 2001]**
(1) 1 (2) 2 (3) 3 (4) 4

3. Energy of first excited state in hydrogen atom is – 3.4 eV then, kinetic energy of electron in same orbit of hydrogen atom is : **[AIPMT 2002]**
(1) + 3.4 eV (2) + 6.8 eV (3) – 13.6 eV (4) + 13.6 eV

4. The value of Planck's constant is 6.63×10^{-34} Js. The velocity of light is 3.0×10^8 ms^{-1}. Which value is closest to the wavelength in nanometers of a quantum of light with frequency of 8×10^{15} s^{-1} ? **[AIPMT 2003]**
(1) 2×10^{-25} (2) 5×10^{-18} (3) 4×10^1 (4) 3×10^7

5. The frequency of the radiation emitted when the electron falls from n = 4 to n = 1 in a hydrogen atom will be (Given ionization energy of H = 2.18×10^{-18} J $atom^{-1}$ and h = 6.625×10^{-34} Js) **[AIPMT 2004]**
(1) 1.54×10^{15} s^{-1} (2) 1.03×10^{15} Js^{-1} (3) 3.08×10^{15} s^{-1} (4) 2.0×10^{15} s^{-1}

6. Among the following transition metal ions, the one set where all the metal ions have $3d^2$ electronic configuration is [At Nos. Ti = 22, V = 23, Cr = 24, Mn = 25] **[AIPMT 2004]**
(1) Ti^{3+}, V^{2+}, Cr^{3+}, Mn^{4+} (2) Ti^{4+}, V^{4+}, Cr^{+6}, Mn^{7+} (3) Ti^{4+}, V^{3+}, Cr^{2+}, Mn^{3+} (4) Ti^{2+}, V^{3+}, Cr^{4+}, Mn^{5+}

7. The energy of the second Bohr orbit of the hydrogen atom is –328 kJ mol^{-1} ; hence the energy of fourth Bohr orbit would be **[AIPMT 2005]**
(1) – 1312 kJ mol^{-1} (2) – 82 kJ mol^{-1} (3) – 41 kJ mol^{-1} (4) – 164 kJ mol^{-1}

8. The Uncertainity involved in the measurement of velocity of electron within a distance of 0.1 Å is : (Given : The mass of electron is 9.11×10^{-31} kg, planck constant is 6.626×10^{-34} J s) **[AIPMT 2006]**
(1) 5.79×10^8 m s^{-1} (2) 5.79×10^5 m s^{-1} (3) 5.79×10^6 m s^{-1} (4) 5.79×10^7 m s^{-1}

9. The orientation of an atomic orbital is governed by : **[AIPMT 2007]**
(1) azimuthal eqantum number (2) spin quantum number
(3) magnetic quantum number (4) principal quantum number

10. Consider the following sets of quantum numbers :

	n	l	m	s
(i)	3	0	0	+1/2
(ii)	2	2	1	+1/2
(iii)	4	3	–2	–1/2
(iv)	1	0	–1	–1/2
(v)	3	2	3	+1/2

Which of the following sets of quantum numbers is not possible ? **[AIPMT 2007]**
(1) (i) and (iii) (2) (ii), (iii) and (iv) (3) (i), (ii), (iii) and (iv) (4) (ii), (iv) and (v)

11. The uncertainity in measurement position of the electron is associated with an uncertainity in momentum, which is equal to 1×10^{-18} g cm s^{-1}. The Uncertainity in electron velocity is, (mass of an electron is 9×10^{-28} g) **[AIPMT 2008]**

(1) 1×10^{9} cm s^{-1} (2) 1×10^{6} cm s^{-1} (3) 1×10^{5} cm s^{-1} (4) 1×10^{11} cm s^{-1}

12. If the uncertainity in position and momentum are equal, then uncertainity in velocity is : **[AIPMT 2008]**

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

13. Maximum number of electrons in a subshell of an atom in determined by the following : **[AIPMT 2009]**

(1) $4l + 2$ (2) $2l + 1$ (3) $4l - 2$ (4) $2n^2$

14. A photon of energy 4.4×10^{-19} J collides with A_2 molecules. If bond energy of A_2 is 4.0×10^{-19} J. Then kinetic energy of per atom of A will be : **[AIPMT 2009]**

(1) 2.0×10^{-20} J (2) 2.2×10^{-19} J (3) 2.0×10^{-19} J (4) 4.0×10^{-20} J

15. Which of the following is not permissible set of quantum numbers of electrons in an atom? **[AIPMT 2009]**

(1) n = 4, l = 0, m = 0, s = – 1/2 (2) n = 5, l = 3, m = 0, s = + 1/2
(3) n = 3, l = 3, m = 0, s = – 1/2 (4) n = 3, l = 2, m = – 2, s = – 1/2

16. A 0.66 kg ball is moving with a speed of 100 m/s. The associated with ball wavelength will be : (h = 6.6×10^{-34} Js) **[AIPMT 2010]**

(1) 6.6×10^{-32} m (2) 6.6×10^{-34} m (3) 1.0×10^{-35} m (4) 1.0×10^{-32} m

17. The total number of atomic orbitals in fourth energy level of an atom are : **[AIPMT 2011]**

(1) 8 (2) 16 (3) 32 (4) 4

18. The energies E_1 and E_2 of two radiations are 25 eV and 50 eV respectively. The relation between their wavelengths (i.e. λ_1 and λ_2) will be : **[AIPMT 2011]**

(1) $\lambda_1 = \lambda_2$ (2) $\lambda_1 = 2\lambda_2$ (3) $\lambda_1 = 4\lambda_2$ (4) $\lambda_1 = \frac{1}{2}\lambda_2$

19. If n = 6, the correct sequence for filling of electrons will be : **[AIPMT 2011]**

(1) ns $\rightarrow$ (n – 2)f $\rightarrow$ (n – 1)d $\rightarrow$ np (2) ns $\rightarrow$ (n – 1)d $\rightarrow$ (n – 2)f $\rightarrow$ np
(3) ns $\rightarrow$ (n – 2)f $\rightarrow$ np $\rightarrow$ (n – 1)d (4) ns $\rightarrow$ np(n – 1)d $\rightarrow$ (n – 2)f

20. According to the Bohr Theory, which of the following transitions in the hydrogen atom will give rise to the least energetic photon ? **[AIPMT 2011]**

(1) n = 6 to n = 1 (2) n = 5 to n = 4 (3) n = 6 to n = 5 (4) n = 5 to n = 3

21. Maximum number of electrons in a subshell having n = 4 and ℓ = 3 are : **[AIPMT 2012]**

(1) 14 (2) 16 (3) 10 (4) 12

22. The correct set of four quantum numbers for the valence elecron of rubidium atom (Z=37) is : **[AIPMT 2012]**

(1) 5, 1, + 1/2 (2) 6, 0, 0 + 1/2 (3) 5, 0, 0 + 1/2 (4) 5, 1, 0 + 1/2

23. The orbital angular momentum of a p-electron is given as : **[AIPMT 2012]**

(1) $\frac{h}{\sqrt{2}\pi}$ (2) $\sqrt{3}\frac{h}{2\pi}$ (3) $\sqrt{\frac{3}{2}\frac{h}{\pi}}$ (4) $\sqrt{6}.\frac{h}{2\pi}$

24. 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} ? **[NEET 2013]**

(1) 25 (2) 50 (3) 75 (4) 10

25. What is the maximum numbers of electrons that can be associated with the following set of quantum numbers ? $n = 3$, $\ell = 1$ and $m = -1$. **[NEET 2013]**

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

26. 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 ? **[NEET 2013]**

(1) Larger the value of n, the larger is the orbit radius.
(2) Equation can be used to calculate the change in energy when the electron changes orbit.
(3) For n = 1, the electron has a more negative energy than it does for n = 6 which mean that the electron is more loosely bound in the smallest allowed orbit.
(4) The negative sign in equation simply means that the energy or electron bound to the nucleus is lower than it would be if the electrons were at the infinite distance from the nucleus.

27. What is the maximum number of orbitals that can be identified with the following quantum number $n = 3$, $\ell = 1$, $m = 0$ **[AIPMT 2014]**

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

28. Calculate the energy in corresponding to light of wavelength 45 nm : (Planck's constant $h = 6.63 \times 10^{-34}$ Js : speed of light $c = 3 \times 10^8$ ms^{-1}) **[AIPMT 2014]**

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

29. Be^{2+} is isoelectronic with which of the following ions? **[AIPMT 2014]**

(1) H^+ (2) Li^+ (3) Na^+ (4) Mg^{2+}

30. Magnetic moment 2.84 B.M. is given by **[AIPMT 2015]**
(At. nos, Ni =28, Ti= 22, Cr =24, Co = 27)

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

31. The number of d-electrons in Fe^{2+} (Z=26) is **not** equal to the number of electrons in which one of the following? **[AIPMT 2015]**

(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)

32. The angular momentum of electron in 'd' orbital is equal to : **[AIPMT 2015]**

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

33. Two electrons occupying the same orbital are distinguished by : **[NEET-1 2016]**

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

34. How many electrons can fit in the orbital for which $n = 3$ and $\ell = 1$? **[NEET-2 2016]**

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

35. Which of the following pairs of d-orbitals will have electron density along the axis ? **[NEET-2 2016]**

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

36. Which one is the **wrong** statement ? **[NEET- 2017]**

(1) de-Broglie's wavelength is given by $\lambda = \frac{h}{m\upsilon}$, where m = mass of the particle, υ = group velocity of the particle.

(2) The uncertainty principle is $\Delta E \times \Delta t \geq \frac{h}{4\pi}$

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

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

37. Which one is a wrong statement? **[NEET- 2018]**

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

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

(3) The electronic configuration of N atom is- $\underset{\boxed{\uparrow\downarrow}}{1s^2}\ \underset{\boxed{\uparrow\downarrow}}{2s^2}\ \underset{\boxed{\uparrow}}{2p_x^1}\underset{\boxed{\uparrow}}{2p_y}\underset{\boxed{\downarrow}}{2p_z^1}$

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

38. Which of the following series of transitions in the spectrum of hydrogen atom falls in visible region ? **[NEET-1- 2019]**

(1) Brackett series (2) Lyman series (3) Balmer series (4) Paschen series

39. 4d, 5p, 5f and 6p orbitals are arranged in the order of decreasing energy. The correct option is : **[NEET-1- 2019]**

(1) 5f > 6p > 4d > 5p (2) 5f > 6p > 5p > 4d (3) 6p > 5f > 5p > 4d (4) 6p > 5f > 4d > 5p

40. Orbital having 3 angular nodes and 3 total nodes is : **[NEET-2- 2019]**

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

41. 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] **[NEET-2- 2019]**

(1) 211.6 pm (2) 211.6 π pm (3) 52.9 π pm (4) 105.8 pm

PART - II : AIIMS QUESTION (PREVIOUS YEARS)

1. The isoelectronic pair is : **[AIIMS 2005]**

(1) Cl_2O, ICl_2^- (2) ICl_2^-, ClO_2 (3) IF_2^+, I_3^- (4) ClO_2^-, ClF_2^+

2. α **–** particles can be detected using : **[AIIMS 2005]**

(1) thin aluminium sheet (2) barium suplhate
(3) zinc sulphide screen (4) gold foil

3. The most probable radius (in pm) for finding the electron in He^+ is : **[AIIMS 2006]**

(1) 0.0 (2) 52.9 (3) 26.5 (4) 105.8

4. The de-broglie wavelength associated with a ball of mass 1 kg having kinetic energy 0.5 J is. **[AIIMS 2006]**

(1) 6.626×10^{-34} m (2) 13.20×10^{-34}m (3) 10.38×10^{-21} m (4) 6.626×10^{-34} Å

5. The uncertainties in the velocities of two particles, A and B are 0.05 and 0.02 ms^{-1}, respectively. The mass of B is five times of that of the mass of A. What is the ratio of uncertainties $\left(\frac{\Delta x_A}{\Delta x_B}\right)$ **[AIIMS 2008]**

(1) 2 (2) 0.25 (3) 4 (4) 1

6. The de–Broglie wavelength of helium atom at room temperature is : **[AIIMS 2009]**
(1) 6.6×10^{-34} m (2) 4.39×10^{-10} m (3) 7.34×10^{-11} m (4) 2.335×10^{-20} m

7. n and ℓ for some electrons are given. Which of the following is expected to have least energy ? **[AIIMS 2009]**
(1) n = 3, ℓ = 2 (2) n = 3, ℓ = 0 (3) n = 2, ℓ = 1 (4) n = 4, ℓ = 0

8. If the photon of the wavelength 150 pm strikes an atom and one of its inner bound electrons is ejected out with a velocity of 1.5×10^7 ms^{-1}, what is the energy with which it is bound to the nucleus ? **[AIIMS 2010]**
(1) 1.2×10^2 eV (2) 2.15×10^3 eV (3) 7.6×10^3 eV (4) 8.12×10^2 eV

9. Smallest wavelength occurs for : **[AIIMS 2011]**
(1) Lyman series (2) Balmer series (3) Paschen series (4) Brackett series

10. Which of the following is wrong for Bohr model ? **[AIIMS 2011]**
(1) It establishes stability of atom.
(2) It is inconsistent with Heisenberg uncertainty principle.
(3) It explains the concept of spectral lines for hydrogen like species.
(4) Electrons behave as particle and wave.

11. Ratio of energy of photon of wavelength 3000Å and 6000Å is : **[AIIMS 2012]**
(1) 3 : 1 (2) 2 : 1 (3) 1 : 2 (4) 1 : 3

12. **Assertion :** Angular momentum of an electron in any orbit is given by angular momentum = $\frac{n,h}{2\pi}$, where n is the principal quantum number. **[AIIMS 2012]**
Reason : The principal quantum number, n, can have any integral value.
(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.

13. A compound of metal ion M^{x+} (Z= 24) has a spin only magnetic moment of $\sqrt{15}$ Bohr Magenetons. The number of unpaired electrons in the compound are **[AIIMS 2013]**
(1) 2 (2) 4 (3) 5 (4) 3

14. Which of the following combinations of quantum numbers is allowed ? **[AIIMS 2013]**

	n	l	m	m_s
(1)	3	2	1	0
(2)	2	0	0	$-\frac{1}{2}$
(3)	3	-3	-2	$+\frac{1}{2}$
(4)	1	0	1	$+\frac{1}{2}$

15. The electrons, identified by quantum numbers n and l (i) n = 4, ℓ = 1 (ii) n = 4, ℓ = 0 (iii) n = 3, ℓ = 2 (iv) n = 3, ℓ = 1 can be placed in order of increasing energy, from the lowest to highest, as **[AIIMS 2014]**

(1) (iv) < (ii) < (iii) < (i) (2) (ii) < (iv) < (v) < (iii) (3) (i) < (iii) < (ii) < (iv) (4) (iii) < (i) < (iv) < (ii)

16. In hydrogen atomic spectrum, a series limit is found at 12186.3 cm^{-1}. Then it belong to **[AIIMS 2014]**
(1) Lyman series (2) Balmer series (3) Paschen series (4) Brackett series

17. **Assertion :** Spin quantum number can have two values, $+\frac{1}{2}$ and $-\frac{1}{2}$ **[AIIMS 2014]**
Reason : + and – signs signify the positive and negative wave functions.
(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.

18. The degeneracy of hydrogen that has energy equal to $\frac{-R_H}{9}$ is : **[AIIMS 2015]**
(1) 6 (2) 8 (3) 5 (4) 9

19. The electrons identified by qunatum numbers n and ℓ : **[AIIMS 2016]**
(a) n = 4, ℓ = 1 (b) n = 4, ℓ = 0 (c) n = 3, ℓ = 2 (d) n = 3, ℓ = 1
can be placed in the order of increasing energy as :
(1) 3 > 4 < 2 < 1 (2) 4 < 2 < 3 < 1 (3) 2 < 4 < 1 3 (4) 1 < 3 2 < 4

20. Which transition in the hydrogen atomic spectrum wil have the same wavelength as the balmer transition (i.e., n = 4 to n = 2) of He^+ spectrum ? **[AIIMS 2017]**
(1) n = 4 to n = 3 (2) n = 3 to n = 2 (3) n = 4 to n = 2 (4) n = 2 to n = 1

21. Wave length of particular transition for H atom is 400 nm. What can be wavelength of He^+ for same transition : **[AIIMS 2018]**
(1) 400 nm (2) 100 nm (3) 1600 nm (4) 200 nm

22. A gas metal in bivalent state have approximately $23e^-$ what is spin magnetic moment in elemental state
(1) 2.87 (2) 5.5 (3) 5.9 (4) 4.9 **[AIIMS 2018]**

23. What is maximum wavelength of line of Balmer series of Hydrogen spectrum (R = 1.09 x 10^7 m^{-1}) :
(1) 400 nm (2) 654 nm (3) 486 nm (4) 434 nm **[AIIMS 2018]**

24. In second orbit of H atom what is velocity of e^- **[AIIMS 2018]**
(1) 2.18×10^6m/sec (2) 3.27×10^6m/sec (3) 10.9×10^5m/sec (4) 21.8×10^6m/sec

25. When on metal sheet fall λ_1 light will eject electron with V_1 velocity and with λ_2 light eject electron of v_2 velocity, what is $v_2^2 - v_1^2$ value **[AIIMS 2018]**
(1) $\frac{2hc}{m}\left(\frac{1}{\lambda_2}-\frac{1}{\lambda_1}\right)$ (2) $\frac{hc}{m}\left(\frac{1}{\lambda_2}-\frac{1}{\lambda_1}\right)$ (3) $\frac{2hc}{m}\left(\frac{1}{\lambda_1}-\frac{1}{\lambda_2}\right)$ (4) $\frac{m}{2hc}\left(\frac{1}{\lambda_2}-\frac{1}{\lambda_1}\right)$

PART - III : JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

1. Which of the following ions has the maximum magnetic moment? **[AIEEE 2002, 3/225]**
(1) Mn^{+2} (2) Fe^{+2} (3) Ti^{+2} (4) Cr^{+2}.

2. Energy of H-atom in the ground state is –13.6 eV, hence energy in the second excited state is : **[AIEEE 2002, 3/225]**

(1) – 6.8 eV (2) – 3.4 eV (3) – 1.51 eV (4) – 4.53 eV

3. Uncertainity in position of a particle of 25 g in space is 10^{-15} m. Hence, Uncertainity in velocity (in m.sec^{-1}) is: (plank's constant, h = 6.6×10^{-34} Js) **[AIEEE 2002, 3/225]**

(1) 2.1×10^{-18} (2) 2.1×10^{-34} (3) 0.5×10^{-34} (4) 5.0×10^{-24}

4. The de-Broglie wavelength of a tennis ball of mass 60 g moving with a velocity of 10 m/s is approximately (planck's constant, h = 6.63×10^{-34} J-s) **[AIEEE 2003, 3/225]**

(1) 10^{-33} m (2) 10^{-31} m (3) 10^{-16} m (4) 10^{-25} m

5. In Bohr series of lines of hydrogen spectrum, the third line from the red end corresponds to which one of the following inner-orbit jumps of the electron for Bohr orbits in an atom of hydrogen ? **[AIEEE 2003, 3/225]**

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

6. The numbers of d-electrons retained in Fe^{2+} (atomic number Fe = 26) ion is **[AIEEE 2003, 3/225]**

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

7. The orbital angular momentum for an electron revolving in an orbit is given by $\sqrt{\ell\ (\ell+1)}\ \frac{h}{2\pi}$. This momentum for an s-electron will be given by **[AIEEE 2003, 3/225]**

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

8. The wavelength of the radiation emitted, when in a hydrogen atom electron falls from infinity to stationary state 1, would be (Rydberg constant = 1.097×10^7 m^{-1}) **[AIEEE 2004, 3/225]**

(1) 91 nm (2) 192 nm (3) 406 (4) 9.1×10^{-6} nm

9. Which of the following set a of quantum numbers is correct for an electron in 4f orbital? **[AIEEE 2004, 3/225]**

(1) n = 4, l =3, m = +4, s = +1/2 (2) n = 4, l = 4, m = –4, s = –1/2
(3) n = 4, l = 3, m = +1, s = +1/2 (4) n = 3, l=2, m =–2, s = +1/2

10. Consider the ground state of Cr atom (Z = 24). The numbers of electrons with the azimuthal quantum numbers, ℓ = 1 and 2 are, respectively **[AIEEE 2004, 3/225]**

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

11. In a multi-electron atom, which of the following orbitals described by the three quantum numbers will have the same energy in the absence of magnetic and electric field ? **[AIEEE 2005, 3/225]**

(i) n = 1, l = 0, m = 0 (ii) n =2, l = 0, m = 0 (iii) n = 2, l = 1, m = 1 (iv) n = 3, l = 2, m =1
(v) n = 3, l = 2, m = 0

(1) (iv) and (v) (2) (iii) and (iv) (3) (ii) and (iii) (4) (i) and (ii)

12. Which of the following statements in relation to the hydrogen atom is correct ? **[AIEEE 2005, 4½/225]**

(1) 3s, 3p and 3d orbitals all have the same energy
(2) 3s and 3p orbitals are of lower energy than 3d orbital
(3) 3p orbital is lower in energy than 3d orbital
(4) 3s orbital is lower in energy than 3p orbital

13. Uncertainity in the position of an electron (mass = 9.1×10^{-31} Kg) moving with a velocity 300 $m.sec^{-1}$, Accurate upto 0.001%, will be : (h = 6.63×10^{-34} J-s) **[AIEEE 2006, 3/165]**

(1) 19.2×10^{-2} m (2) 5.76×10^{-2} m (3) 1.92×10^{-2} m (4) 3.84×10^{-2} m

14. According to Bohr's theory, the angular momentum to an electron in 5^{th} orbit is : **[AIEEE 2006, 3/165]**

(1) $25\ \frac{h}{\pi}$ (2) $1.0\ \frac{h}{\pi}$ (3) $10\ \frac{h}{\pi}$ (4) $2.5\ \frac{h}{\pi}$

15. The 'spin-only' magnetic moment [in units of Bohr magneton (μ_β)] of Ni^{2+} in aqueous solution would be (Atomic number : Ni = 28) **[AIEEE 2006, 3/165]**

(1) 2.84 (2) 4.90 (3) 0 (4) 1.73

16. Which of the following nuclear reactions will generate an isotope ? **[AIEEE 2007, 3/120]**

(1) Neutron particle emission (2) Positron emission

(3) α-particle emission (4) β-particle emission

17. The ionisation enthalpy of hydrogen atom is 1.312×10^6 J mol^{-1}. The energy required to excite the electron in the atom from $n_1 = 1$ to $n_2 = 2$ is **[AIEEE 2008, 3/105]**

(1) 8.51×10^5 J mol^{-1} (2) 6.56×10^5 J mol^{-1} (3) 7.56×10^5 J mol^{-1} (4) 9.84×10^5 J mol^{-1}

18. Which of the following set of quantum numbers represents the highest energy of an atom ? **[AIEEE 2008, 3/105]**

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

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

19. The energy required to break one mole of Cl – Cl bonds in Cl_2 is 242 kJ mol^{-1} . The longest wavelength of light capable of breaking a single Cl – Cl bond is **[AIEEE 2010, 4/144]**
($c = 3 \times 10^8$ m s^{-1} and $N_A = 6.02 \times 10^{23}$ mol^{-1})

(1) 594 nm (2) 640 nm (3) 700 nm (4) 494 nm

20. Ionisation energy of He^+ is 19.6×10^{-18} J $atom^{-1}$. The energy of the first stationary state (n = 1) of Li^{2+} is **[AIEEE 2010, 4/144]**

(1) 4.41×10^{-16} J $atom^{-1}$ (2) -4.41×10^{-17} J $atom^{-1}$

(3) -2.2×10^{-15} J $atom^{-1}$ (4) 8.82×10^{-17} J $atom^{-1}$

21. A gas absorbs a photon of 355 nm and emits at two wavelengths. If one of the emission is at 680 nm, the other is at : **[AIEEE 2011, 4/120]**

(1) 1035 nm (2) 325 nm (3) 743 nm (4) 518 nm

22. The frequency of light emitted for the transition n = 4 to n = 2 of He^+ isequalto the transition in H atom corresponding to which of the following? **[AIEEE 2011, 4/120]**

(1) n = 2 to n = 1 (2) n = 3 to n = 2 (3) n = 4 to n = 3 (4) n = 3 to n = 1

23. The electrons identified by quantum numbers n and ℓ : **[AIEEE 2012, 4/120]**

(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) (c) < (d) < (b) < (a) (2) (d) < (b) < (c) < (a) (3) (b) < (d) < (a) < (c) (4) (a) < (c) < (b) < (d)

24. Energy of an electron is given by E = –2.178 × 10^{-18}J. $\left(\frac{Z^2}{n^2}\right)$ Wavelength of light required to excite an electron in an hydrogen atom fr/om level n = 1 to n = 2 will be : (h = 6.62 × 10^{-34} Js and c = 3.0 × 10^8 ms^{-1}) **[JEE(Main)2013]**
(1) 1.214 × 10^{-7} m (2) 2.816 × 10^{-7} m (3) 6.500 × 10^{-7} m (4) 8.500 × 10^{-7} m

25. The correct set of four quantum numbers for the valence electrons of rubidium atom (Z = 37) is : **[JEE(Main)2014, 4/120]**
(1) 5, 0, 0, + $\frac{1}{2}$ (2) 5, 1, 0, + $\frac{1}{2}$ (3) 5,1, 1, + $\frac{1}{2}$ (4) 5, 0, 1, + $\frac{1}{2}$

26. Which of the following is the energy of a possible excited state of hydrogen ? **[JEE(Main) 2015, 4/120]**
(1) +13.6 eV (2) –6.8 eV (3) –3.4 eV (4) +6.8 eV

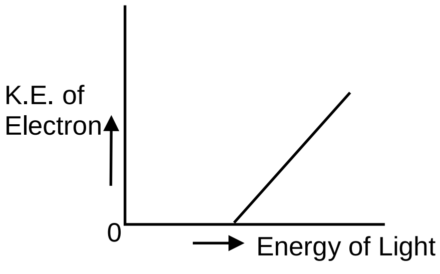
27. A stream of electrons from a heated filament was passed between two charged plates kept at a potential difference V esu. If e and m are charge and mass of an electron, respectively, then the value of h/λ (where λ is wavelength associated with electron wave) is given by : **[JEE(Main) 2016, 4/120]**
(1) 2meV (2) $\sqrt{meV}$ (3) $\sqrt{2meV}$ (4) meV

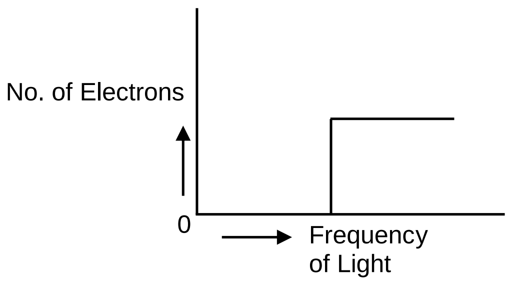
28. The radius of the second Bohr orbit for hydrogen atom is : **[JEE(Main) 2017, 4/120]**
(Planck's Const. h = 6.6262 × 10^{-34} Js; mass of electron = 9.1091 × 10^{-31} kg; charge of electron e = 1.60210 × 10^{-19} C; permittivity of vacuum ϵ_0 = 8.854185 × 10^{-12} $kg^{-1}m^{-3}A^2$)
(1) 4.76 Å (2) 0.529 Å (3) 2.12 Å (4) 1.65 Å

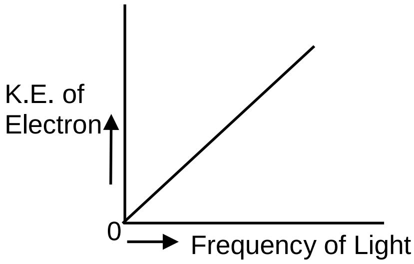
28. For emission line of atomic hydrogen from n_i = 8 to n_f = n, the plot of wave number $(\bar{\nu})$ against $\left(\frac{1}{n^2}\right)$ will be (The Rydberg constant, R_H is in wave number unit) **[JEE(Main) 2019, 4/120]**
(1) Linear with intercept $-R_H$ (2) Linear with slope $-R_H$
(3) Non linear (4) Linear with slope R_H

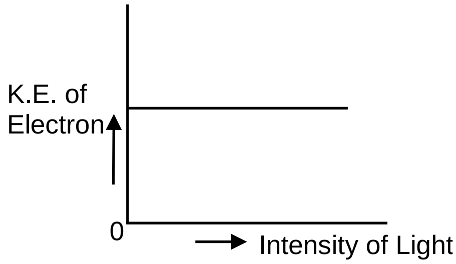
29. Which of the following combination of statements is true regarding the interpretation of the atomic orbitals? **[JEE(Main) 2019, 4/120]**
(a) An electron in an orbital of high angular momentum stays away from the nucleus than an electron in the orbitals of lower angular momentum.
(b) For a given value of the principal quantum number, the size of the orbit is inversely proportional to the azimuthal quantum number.
(c) According to wave mechanics, the ground state angular momentum is equal to $\frac{h}{2\pi}$.
(d) The plot of Ψ Vs r for various azimuthal quantum numbers, show peak shifting towards higher value.
(1) (b), (c) (2) (a), (c) (3) (a), (d) (4) (a), (b)

30. Which of the graphs shown below does not represent the relationship between incident light and the electron ejected from metal surface ? **[JEE(Main) 2019, 4/120]**

(1)


(2)


(3) 

(4) 

31. The ground state energy of hydrogen atom is –13.6 eV. The energy of second excited state of He^+ ion eV. Is: **[JEE(Main) 2019, 4/120]**

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

32. The de Broglie wavelength (λ) associated with a photoelectron varies with the frequency (ν) of the incident radiation as, [ν_0 is threshold frequency] : **[JEE(Main) 2019, 4/120]**

(1) $\lambda \propto \dfrac{1}{(\nu - \nu_0)^{\frac{3}{2}}}$ (2) $\lambda \propto \dfrac{1}{(\nu_0 - \nu_0)}$ (3) $\lambda \propto \dfrac{1}{(\nu - \nu_0)^{\frac{1}{2}}}$ (4) $\lambda \propto \dfrac{1}{(\nu - \nu_0)^{\frac{1}{4}}}$

33. Heat treatment of muscular pain involves radiation of wavelength of about 900 nm. Which spectral line of H-atom is suitable for this purpose ? **[JEE(Main) 2019, 4/120]**

[$R_H = 1 \times 10^5$ cm^{-1}, $h = 6.6 \times 10^{-34}$ Js, $c = 3 \times 10^8$ ms^{-1}]

(1) Paschen, $\infty \to 3$ (2) Paschen, $5 \to 3$ (3) Balmer, $\infty \to 2$ (4) Lyman, $\infty \to 1$

34. If the de Broglie wavelength of the electron in nth Bohr orbit in a hydrogenic atom is equal to 1.5 πa_0 (a_0 is Bohr radius), then the value of n/z is: **[JEE(Main) 2019, 4/120]**

(1) 0.75 (2) 0.40 (3) 1.0 (4) 1. 50

Answers

EXERCISE - 1

SECTION (A)

1.	(1)	**2.**	(4)	**3.**	(3)	**4.**	(2)	**5.**	(2)	**6.**	(4)	**7.**	(1)
8.	(3)	**9.**	(2)	**10.**	(4)	**11.**	(3)	**12.**	(1)	**13.**	(3)	**14.**	(4)
15.	(4)												

SECTION (B)

1.	(2)	**2.**	(3)	**3.**	(1)	**4.**	(1)	**5.**	(4)	**6.**	(1)	**7.**	(1)
8.	(1)	**9.**	(4)	**10.**	(3)	**11.**	(3)	**12.**	(3)	**13.**	(2)	**14.**	(3)
15.	(1)												

SECTION (C)

1.	(2)	**2.**	(2)	**3.**	(2)	**4.**	(2)	**5.**	(3)	**6.**	(1)	**7.**	(2)
8.	(2)	**9.**	(1)	**10.**	(2)	**11.**	(1)	**12.**	(4)	**14.**	(2)	**14.**	(4)
15.	(1)	**16.**	(4)	**17.**	(1)	**18.**	(1)	**19.**	(2)	**20.**	(2)	**21.**	(2)
22.	(2)	**23.**	(4)	**24.**	(3)	**25.**	(4)	**26.**	(1)	**27.**	(3)		

SECTION (D)

1.	(4)	**2.**	(1)	**3.**	(2)	**4.**	(1)	**5.**	(4)	**6.**	(4)	**7.**	(4)
8.	(3)	**9.**	(3)	**10.**	(2)	**11.**	(3)	**12.**	(2)	**13.**	(3)	**14.**	(1)

SECTION (E)

1.	(3)	**2.**	(1)	**3.**	(3)	**4.**	(3)	**5.**	(1)	**6.**	(2)	**7.**	(4)
8.	(1)	**9.**	(4)	**10.**	(2)	**11.**	(2)	**12.**	(2)	**13.**	(3)	**14.**	(3)
15.	(4)												

SECTION (F)

1.	(3)	**2.**	(4)	**3.**	(1)	**4.**	(4)	**5.**	(4)	**6.**	(2)	**7.**	(4)
8.	(3)	**9.**	(4)	**10.**	(1)	**11.**	(4)	**12.**	(2)	**13.**	(1)	**14.**	(2)
15.	(1)	**16.**	(2)	**17.**	(2)	**18.**	(2)	**19.**	(3)	**20.**	(3)	**21.**	(2)
22.	(2)	**23.**	(4)	**24.**	(3)	**25.**	(2)	**26.**	(3)	**27.**	(4)		

SECTION (G)

1.	(1)	**2.**	(4)	**3.**	(3)	**4.**	(3)	**5.**	(4)	**6.**	(2)	**7.**	(3)
8.	(1)	**9.**	(3)	**10.**	(3)	**11.**	(4)	**12.**	(2)				

EXERCISE - 2

1.	(4)	**2.**	(1)	**3.**	(4)	**4.**	(2)	**5.**	(2)	**6.**	(4)	**7**	(1)
8.	(1)	**9.**	(2)	**10.**	(3)	**11.**	(3)	**12.**	(1)	**13.**	(2)	**14.**	(1)
15.	(3)	**16.**	(4)	**17.**	(3)	**18.**	(2)	**19.**	(3)	**20.**	(2)	**21.**	(1)
22.	(3)	**23.**	(1)	**24.**	(3)	**25.**	(3)	**26.**	(4)	**27.**	(2)	**28.**	(4)
29.	(1)	**30.**	(1)	**31.**	(3)	**32.**	(3)	**33.**	(1)	**34.**	(2)	**35.**	(2)
36.	(1)	**37.**	(1)	**38.**	(2)	**39.**	(1)	**40.**	(1)	**41.**	(4)	**42.**	(4)
43.	(1)	**44.**	(4)	**45.**	(2)	**46.**	(4)	**47.**	(1)	**48.**	(1)	**49.**	(2)
50.	(2)	**51.**	(4)	**52.**	(3)	**53.**	(4)	**54.**	(3)	**55.**	(3)		

EXERCISE - 3

PART-I

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

PART-II

1.	(4)	**2.**	(3)	**3.**	(3)	**4.**	(1)	**5.**	(1)	**6.**	(3)	**7.**	(3)
8.	(3)	**9.**	(1)	**10.**	(4)	**11.**	(2)	**12.**	(2)	**13.**	(4)	**14.**	(2)
15.	(1)	**16.**	(3)	**17.**	(3)	**18.**	(4)	**19.**	(2)	**20.**	(4)	**21.**	(2)
22.	(3)	**23.**	(2)	**24.**	(3)	**25.**	(1)						

PART-III

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