

1. The energy of an electron in the ground state ($n = 1$) for He^+ ion is $-x$ J, then that for an electron in $n=2$ state for Be^{3+} ion in J is : **(2024)**

- (a) $-\frac{x}{9}$ (b) $-4x$
(c) $-\frac{4}{9}x$ (d) $-x$

2. Match List I with List II. **(2024)**

List I Quantum Number		List II Information provided	
A.	m_l	I.	shape of orbital
B.	m_s	II.	size of orbital
C.	l	III.	orientation of orbital
D.	n	IV.	orientation of spin of electron

Choose the correct answer from the options given below:

- (a) A – III, B – IV, C – I, D – II
(b) A – III, B – IV, C – II, D – I
(c) A – II, B – I, C – IV, D – III
(d) A – I, B – III, C – II, D – IV
3. Incorrect set of quantum numbers from the following is: **(2023)**
- (a) $n = 4, l = 3, m_l = -3, -2, -1, 0, +1, +2, +3, m_s = -1/2$
(b) $n = 5, l = 2, m_l = -2, -1, +1, +2, m_s = +1/2$
(c) $n = 4, l = 2, m_l = -2, -1, 0, +1, +2, m_s = -1/2$
(d) $n = 5, l = 3, m_l = -3, -2, -1, 0, +1, +2, +3, m_s = +1/2$
4. Given below are two statements:
Statement I: The value of wave function, ψ depends upon the coordinates of the electron in the atom.
Statement II: The probability of finding an electron at a point within an atom is proportional to the orbital wave function. In the light of the above statements, choose the correct answer from the option given below: **(2023)**

- (a) Statement I is true but Statement II is false.
(b) Statement II is false but Statement I is true.
(c) Both Statement I and Statement II are true.
(d) Both Statement I and Statement II are false.

5. 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 9.10939×10^{-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 option given below. **(2023)**

- (a) C, D and E only
(b) A and E only
(c) B, C and E only
(d) A, B and C only

6. 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 **(2023)**

- (a) $l = 2n_m + 1$
(b) $n_m = 2l^2 + 1$
(c) $n_m = l + 2$
(d) $l = \frac{n_m - 1}{2}$

7. Match List I with List II:

List I (quantum number)		List II (orbital)	
(A)	$n = 2, l = 1$	(i)	2s
(B)	$n = 3, l = 2$	(ii)	3s
(C)	$n = 3, l = 0$	(iii)	2p
(D)	$n = 2, l = 0$	(iv)	3d

Choose the correct answer from the options given below: **(2022)**

- (a) A-iii, B-iv, C-ii, D-i
(b) A-iii, B-iv, C-i, D-ii
(c) A-iv, B-iii, C-i, D-ii
(d) A-iv, B-iii, C-ii, D-i
8. When electromagnetic radiation of wavelength 300 nm falls on the surface of a metal, electrons are emitted with the kinetic energy of $1.68 \times 10^5 \text{ J mol}^{-1}$. What is the minimum energy needed to remove an electron from the metal? **(2022)**
($h = 6.626 \times 10^{-34} \text{ Js}$, $c = 3 \times 10^8 \text{ ms}^{-1}$, $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$)
(a) $2.31 \times 10^5 \text{ J mol}^{-1}$
(b) $2.31 \times 10^6 \text{ J mol}^{-1}$
(c) $3.84 \times 10^4 \text{ J mol}^{-1}$
(d) $3.84 \times 10^{-19} \text{ J mol}^{-1}$
9. Identify the incorrect statement from the following. **(2022)**
(a) All the five 5d orbitals are different in size when compared to the respective 4d orbitals.
(b) All the five 4d orbitals have shapes similar to the respective 3d orbitals.
(c) In an atom, all the five 3d orbitals are equal in energy in free state.
(d) 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.
10. 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? **(2022)**
(a) 158.7 pm (b) 15.87 pm
(c) 1.587 pm (d) 158.7 Å
11. 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 : **(2021)**
[speed of light, $c = 3.0 \times 10^8 \text{ ms}^{-1}$]
(a) 219.2 m (b) 2192 m
(c) 21.92 m (d) 219.3 m
12. The number of protons, neutrons and electrons in $^{175}_{71}\text{Lu}$, respectively, are : **(2020)**
(a) 104, 71 and 71
(b) 71, 71 and 104
(c) 175, 104 and 71
(d) 71, 104 and 71
13. The number of angular nodes and radial nodes in 3s orbital are **(2020 Covid Re-NEET)**
(a) 1 and 0, respectively

(b) 3 and 0, respectively

(c) 0 and 1, respectively

(d) 0 and 2, respectively

14. 4d, 5p, 5f and 6p orbitals are arranged in the order of decreasing energy. The correct option is **(2019)**

(a) $5f > 6p > 5p > 4d$

(b) $6p > 5f > 5p > 4d$

(c) $6p > 5f > 4d > 5p$

(d) $5f > 6p > 4d > 5p$

15. Which of the following series of transitions in the spectrum of hydrogen atom fall in visible region? **(2019)**

(a) Lyman series

(b) Balmer series

(c) Paschen series

(d) bracket series

16. Magnesium reacts with an element (X) to form an ionic compound. If the ground state electronic configuration of (X) is $1s^2 2s^2 2p^3$, the simplest formula for this compound is **(2018)**

(a) Mg_2X_3 (b) MgX_2

(c) Mg_3X_2 (d) Mg_2X

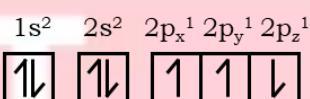
17. Which one is a wrong statement? **(2018)**

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

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

(c) The value of m for d_z^2 is zero

(d) The electronic configuration of N atom is



18. Which one is the wrong statement? **(2017-Delhi)**

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

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

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

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

19. The total number of orbitals present for principal quantum number, $n = 4$ is :
(2017-Gujarat)
(a) 30 (b) 12
(c) 15 (d) 16
20. Which of the following pairs of d-orbitals will have electron density along the axes?
(2016-II)
(a) $d_{z^2}, d_{x^2-y^2}$ (b) $d_{xy}, d_{x^2-y^2}$
(c) d_{z^2}, d_{xz} (d) d_{xz}, d_{yz}
21. How many electrons can fit in the orbital for which : $n = 3$ and $l = 1$? (2016-II)
(a) 10 (b) 14
(c) 2 (d) 6
22. Two electrons occupying the same orbital are distinguished by : (2016-I)
(a) Spin quantum number
(b) Principal quantum number
(c) Magnetic quantum number
(d) Azimuthal quantum number
23. Which is the correct order of increasing energy of the listed orbitals in the atom of titanium? (Atomic number $Z = 22$)
(2015 Re)
(a) 3s 3p 4s 3d (b) 3s 4s 3p 3d
(c) 4s 3s 3p 3d (d) 3s 3p 3d 4s
24. The angular momentum of electron in 'd' orbital is equal to : (2015)
(a) $2\sqrt{3} \hbar$ (b) $0 \hbar$
(c) $\sqrt{6} \hbar$ (d) $\sqrt{2} \hbar$
25. What is the maximum number of orbitals that can be identified with the following quantum numbers: (2014)
(a) 2 (b) 3
(c) 4 (d) 1
26. Calculate the energy in joule corresponding to light of wavelength 45 nm (Planck's constant $h = 6.63 \times 10^{-34}$ Js; speed of light $c = 3 \times 10^8 \text{ ms}^{-1}$)
(2014)
(a) 6.67×10^{11} (b) 4.42×10^{-15}
(c) 4.42×10^{-18} (d) 6.67×10^{15}
27. What is the maximum number of electrons that can be associated with the following set of quantum numbers? ($n = 3, l = 1$ and $m = -1$). (2013)
(a) 10 (b) 6
(c) 4 (d) 2
28. The value of Planck's constant is $6.63 \times 10^{-34} \text{ Js}$. The speed of light is $3 \times 10^8 \text{ ms}^{-1}$. Which value is closest to the wavelength in nanometer of a quantum of light with frequency of $6 \times 10^{15} \text{ s}^{-1}$?
(2013)
(a) 10 nm (b) 25 nm
(c) 50 nm (d) 75 nm
29. 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? (2013)
(a) The negative sign in equation simply means that the energy of electron bound to the nucleus is lower than it would be if the electrons were at the infinite distance from the nucleus.
(b) Larger the value of n , the larger is the orbit radius.
(c) Equation can be used to calculate the change in energy when the electron changes orbit.
(d) For $n = 1$, the electron has a more negative energy than it does for $n = 6$ which means that the electron is more loosely bound in the smallest allowed orbit.