



Atomic Structure

Exam-1

Sub: Chemistry | Syllabus: Full Chapter | JEE

Your teachers can guide you, but your growth comes from facing your own struggles. This pain? It's shaping you.

- The ionization energy of the ground-state hydrogen atom is 2.18×10^{-18} J. The energy of an electron in its second orbit would be:**
 - -1.09×10^{-18} J
 - -2.18×10^{-18} J
 - -4.36×10^{-18} J
 - -5.45×10^{-19} J
- For a d -electron, the orbital angular momentum is:**
 - $\sqrt{6} \frac{h}{2\pi}$
 - $\sqrt{2} \frac{h}{2\pi}$
 - $\frac{h}{\pi}$
 - $\frac{h}{2\pi}$
- The electrons identified by quantum numbers n, ℓ — (i) 4, 1; (ii) 4, 0; (iii) 3, 2; (iv) 3, 1 — can be placed in order of increasing energy from lowest to highest as:**
 - iv < ii < iii < i
 - ii < iv < i < iii
 - i < iii < ii < iv
 - iii < i < iv < ii
- Ground state electronic configuration of nitrogen atom can be represented by:**
 - $\uparrow\downarrow \uparrow\downarrow \uparrow \uparrow \uparrow$
 - $\uparrow\downarrow \uparrow\downarrow \uparrow \downarrow \uparrow$
 - $\uparrow\downarrow \uparrow\downarrow \uparrow \downarrow \downarrow$
 - $\uparrow\downarrow \uparrow\downarrow \downarrow \downarrow \downarrow$

5. **If the nitrogen atom had electronic configuration $(1s)^7$, it would have energy lower than that of $(1s)^2(2s)^2(2p)^3$ because electrons would be closer to the nucleus. Yet $(1s)^7$ is not observed because it violates:**
- (A) Heisenberg uncertainty principle
 (B) Hund's rule
 (C) Pauli exclusion principle
 (D) Bohr postulate of stationary orbits
6. **Which of the following statements on the atomic wave function ψ is *not* correct?**
- (A) ψ may be a real-valued wave function
 (B) ψ may, in some cases, be a complex function
 (C) ψ has a mathematical significance only
 (D) ψ is proportional to the probability of finding an electron
7. **Which of the following sets of quantum numbers is *not* allowed?**
- (A) $n = 2, \ell = 1, m = +2$
 (B) $n = 1, \ell = 1, m = +1$
 (C) $n = 2, \ell = 0, m = 0$
 (D) $n = 2, \ell = 1, m = -1$
8. **Statement–I: In photoelectric effect, the number of electrons emitted is proportional to the frequency of incident radiation.**
Statement–II: Larger the frequency of incident photon, larger the energy of photon.
- (A) Statement–I is correct and Statement–II is correct *and* is the correct explanation of I
 (B) Statement–I is correct and Statement–II is correct but *not* the correct explanation of I
 (C) Statement–I is correct and Statement–II is incorrect
 (D) Statement–I is incorrect and Statement–II is correct
9. **Match the entries in Column–I for the spectral series of hydrogen with those in Column–II. The symbols n_1 and n_2 are the quantum levels in $\Delta E = hcR_H \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$.**

Column–I

- a) Lyman series
 b) Balmer series
 c) Paschen series
 d) Pfund series

Column–II

- p) $n_1 = 2$ and $n_2 = 3, 4, 5, \dots$
 q) $n_1 = 4$ and $n_2 = 5, 6, 7, \dots$
 r) $n_1 = 5$ and $n_2 = 6, 7, \dots$
 s) $n_1 = 1$ and $n_2 = 2, 3, 4, \dots$
 t) $n_1 = 3$ and $n_2 = 4, 5, 6, \dots$

- (A) a–s, b–p, c–t, d–r
 (B) a–r, b–p, c–t, d–s
 (C) a–s, b–t, c–p, d–r
 (D) a–s, b–p, c–r, d–t

10. Match the orbitals given in Column-I with their characteristic properties mentioned in column-II

	Column-I		Column-II
a)	2s orbital	p)	one radial node + one nodal plane
b)	3s orbital	q)	one radial node + no nodal plane
c)	3p orbitals	r)	two radial nodes + no nodal plane
d)	4d orbitals	s)	one radial node + two nodal planes

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

11. (Integer) Number of correct statements from the following statements regarding Bohr theory of hydrogen atom is/are correct

- (A) Kinetic energy of an electron in an orbit is equal to half of magnitude of its potential energy
 (B) Kinetic energy of an electron in an orbit is equal to the magnitude of its potential energy
 (C) Total energy of an electron is equal to negative of its kinetic energy
 (D) Potential energy of an electron in an orbit is equal to $-mv^2$.

12. (Integer) For Li^{2+} , $r_2 : r_5 = x : 25$. Find x .

13. (Integer) A metal in its dipositive state has configuration 2, 8, 14 and atomic weight = 56. Number of neutrons in its nucleus would be: