



Mix Test-1

Some basic concepts of chemistry + Atomic structure

JEE

Your journey isn't just in textbooks—it's also in patience, consistency, sacrifice. That's what real success is made of.

Section A: MCQs

Q1. Energy in first excited state of Be^{3+} .

The energy of an electron in the first Bohr orbit of the H-atom is -13.6 eV. The magnitude of energy of an electron in the first excited state of Be^{3+} is (in eV):

- (1) 60
- (2) 54
- (3) 50
- (4) 68

Q2. Radius of the first excited state of He^+ .

- (1) $4 a_0$
- (2) $2 a_0$
- (3) $4 a_0$
- (4) $2 a_0$

Q3. Spectral transition & degeneracy (statements).

- (I) A spectral line will be observed for a $2p_x \rightarrow 2p_y$ transition.
- (II) $2p_x$ and $2p_y$ are degenerate orbitals.

Choose the correct answer:

- (1) I false, II true
- (2) Both I and II false
- (3) I true, II false
- (4) Both I and II true

Q4. Suitable H-atom spectral line for $\lambda \approx 900$ nm. Heat treatment of muscular pain involves radiation of wavelength about 900nm. Which spectral line of H atom is suitable for this?

Given: $R_H = 1.096 \times 10^5 \text{ cm}^{-1}$, $h = 6.6 \times 10^{-34} \text{ J s}$, $c = 3 \times 10^8 \text{ m/s}$.

- (1) Lyman series, $1 \rightarrow \infty$
- (2) Balmer series, $2 \rightarrow \infty$
- (3) Paschen series, $3 \rightarrow 5$
- (4) Paschen series, $3 \rightarrow \infty$

Q5. Degeneracy in a multielectron atom (no external fields).

Which orbitals (n, ℓ, m_ℓ) have the same energy?

A: (1, 0, 0), B: (2, 0, 0), C: (3, 1, 1), D: (3, 2, 1), E: (3, 2, 0)

- (1) B and C only
- (2) C and D only
- (3) A and B only
- (4) D and E only

Q6. Sequences of orbital energies in H atom (which are not correct).

- (1) $1s < 2p < 3d < 4s$
- (2) $1s < 2s = 2p < 3s = 3p$
- (3) $1s < 2s < 2p < 3s < 3p$
- (4) $1s < 2s < 4s < 3d$

Q7. Heisenberg uncertainty (paired statements).

(I) It is impossible to specify simultaneously with arbitrary precision both the linear momentum and the position of a particle.

(II) If the uncertainties in position and momentum are equal for an electron, then the uncertainty in velocity is $\geq \frac{h}{2\pi m}$.

- (1) I false, II true
- (2) Both I and II true
- (3) Both I and II false
- (4) I true, II false

Q8. Facts about the $2p_x$ orbital.

Which statements are true?

- (A) ℓ describes the shape of the orbital.
- (B) The figure (boundary surface) shown is for $2p_x$.
- (C) The + and - signs in the $2p_x$ wave function refer to charge.
- (D) The wave function of $2p_x$ is zero everywhere in the xy -plane.

- (1) (A) and (B) only
- (2) (B) and (D) only
- (3) (C) and (D) only
- (4) (A), (B) and (C) only

Q9. Empirical formula mass from % composition.

An organic compound X has: C 14.5%, Cl 64.46%, H 1.8%. Empirical formula mass of X is $\dots \times 10^{-1}$.

(Molar masses in g mol^{-1} : C=12, H=1, O=16, Cl=35.5)

- (1) 1800

- (2) 1655
- (3) 1825
- (4) 1765

Q10. Largest number of atoms.

Number of atoms is the largest in:

- (1) 4.0 g of hydrogen
- (2) 71.0 g of chlorine
- (3) 127.0 g of iodine
- (4) 48.0 g of magnesium

Section B: Integer Type Questions

Q11. Mixing two NaOH solutions.

20 mL of 2 M NaOH is added to 400 mL of 0.5 M NaOH. The final concentration is $\dots \times 10^{-2}$ M (nearest integer).

Q12. Estimation of sulphur.

During "S" estimation, 160 mg of an organic compound gives 466 mg of BaSO₄. The percentage of sulphur in the compound is %.

(Molar masses in g mol⁻¹: Ba = 137, S = 32, O = 16)

Q13. CaO from limestone.

Amount of CaO produced on heating 150 kg limestone (75% pure) is (kg, nearest integer).

(Given in g mol⁻¹: Ca = 40, O = 16, C = 12)