

CHEMISTRY

CLASS XII

COMPETENCY BASED EXAM – NOVEMBER 2025

Coordination Chemistry

Q1. The coordination number of Co in $[\text{Co}(\text{NH}_3)_6]^{3+}$ is:

- A. 3
- B. 4
- C. 6
- D. 2

Answer: C. 6

Reasoning: Six ligands (NH_3) are directly bonded to Co \rightarrow CN = 6.

Q2. Which of the following complexes will show optical isomerism?

- A. $[\text{Co}(\text{NH}_3)_6]^{3+}$
- B. $[\text{Co}(\text{en})_3]^{3+}$
- C. $[\text{Fe}(\text{CN})_6]^{3-}$
- D. $[\text{Ni}(\text{CO})_4]$

Answer: B. $[\text{Co}(\text{en})_3]^{3+}$

Reasoning: Presence of three bidentate ligands (en) \rightarrow chiral complex \rightarrow optical isomerism.

Q3. Assertion-Reason

Assertion (A): $[\text{Ni}(\text{CO})_4]$ is diamagnetic.

Reason (R): CO is a strong field ligand, causing pairing of electrons in Ni^{2+} ($3d^8$) and leading to sp^3 hybridization.

- A. Both A and R are true, and R is the correct explanation of A
- B. Both A and R are true, but R is not the correct explanation of A
- C. A is true, R is false
- D. A is false, R is true

Answer: A

Q4. The geometry of $[\text{Fe}(\text{CN})_6]^{3-}$ is:

- A. Tetrahedral

- B. Octahedral
- C. Square planar
- D. Trigonal bipyramidal

Answer: B. Octahedral

Reasoning: Six ligands \rightarrow octahedral geometry.

Q5. The color of transition metal complexes is due to:

- A. Charge transfer only
- B. d-d transitions
- C. s-p transitions
- D. f-f transitions

Answer: B. d-d transitions

Reasoning: Absorption of visible light promotes electron between split d-orbitals.

Haloalkanes

Q6. The major product in the reaction of $\text{CH}_3\text{CH}_2\text{Br}$ with alcoholic KOH is:

- A. $\text{CH}_3\text{CH}_2\text{OH}$
- B. $\text{CH}_2=\text{CH}_2$
- C. $\text{CH}_3\text{CH}_2\text{K}$
- D. $\text{CH}_3\text{CH}_2\text{Cl}$

Answer: B. $\text{CH}_2=\text{CH}_2$

Reasoning: Alcoholic KOH favors elimination (dehydrohalogenation) \rightarrow ethene.

Q7. Which of the following haloalkanes reacts fastest by $\text{S}_{\text{N}}1$ mechanism?

- A. CH_3Cl
- B. $\text{CH}_3\text{CH}_2\text{Cl}$
- C. $(\text{CH}_3)_3\text{CCl}$
- D. $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$

Answer: C. $(\text{CH}_3)_3\text{CCl}$

Reasoning: $\text{S}_{\text{N}}1$ depends on carbocation stability \rightarrow tertiary carbocation most stable.

Q8. Assertion-Reason

Assertion (A): Allyl chloride undergoes $\text{S}_{\text{N}}1$ reaction faster than n-propyl chloride.

Reason (R): Allyl carbocation formed is resonance stabilized.

- A. Both A and R are true, and R is the correct explanation of A
- B. Both A and R are true, but R is not the correct explanation of A
- C. A is true, R is false
- D. A is false, R is true

Answer: A

Q9. The order of reactivity of alkyl halides towards SN2 reaction is:

- A. $3^\circ > 2^\circ > 1^\circ$
- B. $1^\circ > 2^\circ > 3^\circ$
- C. $2^\circ > 1^\circ > 3^\circ$
- D. $3^\circ > 1^\circ > 2^\circ$

Answer: B. $1^\circ > 2^\circ > 3^\circ$

Reasoning: SN2 is hindered by steric crowding \rightarrow primary halides react fastest.

Q10. Assertion-Reason

Assertion (A): CH_3F is less reactive towards nucleophilic substitution than CH_3I .

Reason (R): C-F bond is stronger and less polarizable compared to C-I bond.

- A. Both A and R are true, and R is the correct explanation of A
- B. Both A and R are true, but R is not the correct explanation of A
- C. A is true, R is false
- D. A is false, R is true

Answer: A