IIT-JEE Chemistry Questions (Hard)

1. Determine the number of isomers of the complex [Co(NH3)4Cl2Br]+, and explain the geometrical arrangement of the ligands in each isomer.

2. Calculate the equilibrium constant for the following reaction at 298 K, given that the standard Gibbs free energy change ("G kJ/mol.

3. Discuss the mechanism and rate law for the nucleophilic substitution reaction between ethyl bromide and hydroxide ion in a protic solvent.

4. Predict the products of the following reaction and explain the stereochemical outcome: (CH3)2CHCH=CHCH(CH3)2 + HBr !Ì

5. Determine the major product of the following cycloaddition reaction: 1,3-butadiene + maleic anhydride !Ì

6. Explain the regio- and stereoselective addition of hydrogen cyanide to an ±,²-unsaturated carbonyl compound via the Michael addition re

7. Discuss the concept of aromaticity and explain why the following compound is considered non-aromatic: [10] annulene.

8. Calculate the cell potential of a galvanic cell with the follov A(s) (E° = -0.3 V) and B+ + 2e- !Ì B(s) (E° = -0.5 V)

9. Derive the van't Hoff equation and explain its significance in studying chemical reactions in solution.

10. Describe the principles and applications of atomic absorption spectroscopy (AAS) for the quantitative analysis of metal ions in environmental samples.