



**INDIAN SCHOOL DARSAIT**  
**DEPARTMENT OF CHEMISTRY**



Subject: Chemistry      Topic : Coordination Compounds      Date of Worksheet: 21.11.2017	
Resource Person: SREEKALA M      Date of Submission: _____	
Name of the Student: _____ Class & Division: XII      Roll Number: _____	
1.	Write the IUPAC name of the following: i) $[\text{Cr}(\text{NH}_3)_3(\text{H}_2\text{O})_3]\text{Cl}_3$ ii) $\text{K}_3[\text{CrF}_6]$ 1
2.	Give an example of coordination isomerism.      1
3.	Among Octahedral and Tetrahedral crystal fields, in which case the magnitude of crystal splitting is larger?      1
4.	Write the formula for potassium trioxalato chromate(III)      1
5.	Give one example of coordination compounds useful in i) biological process ii) extraction of metals.      1
7.	Why is CO a stronger ligand than $\text{Cl}^-$ ?      1
8.	Why does a tetrahedral complex of the type $[\text{MA}_2\text{B}_2]$ not show geometrical isomerism.      1
9.	Draw the structures of isomers, if any, and write the names of the following complexes .i) $[\text{Cr}(\text{NH}_3)_4\text{Cl}_2]^+$ ii) $[\text{Co}(\text{en})_3]^{3+}$ 2
10.	Describe the state of hybridization , the shape and the magnetic behavior of the following complexes: i) $[\text{Cr}(\text{H}_2\text{O})_2(\text{C}_2\text{O}_4)_2]^-$ ii) $[\text{Co}(\text{NH}_3)_2(\text{en})_2]^{3+}$ 2
11.	A coordination compound has the formula $\text{CoCl}_3.4\text{NH}_3$ . It does not liberate ammonia but forms one mole of AgCl with $\text{AgNO}_3$ . Write the structure and IUPAC name of the complex compound.      2
13.	Explain the following terms: i) Crystal field splitting in an octahedral field.    ii) Spectrochemical series .iii) Linkage isomerism    iv) an outer orbital complex.    v) A bidentate ligand vi) Denticity of a ligand      1 mark each
14.	On the basis of CFT explain why $\text{Co}(\text{III})$ forms paramagnetic octahedral complex with weak ligands whereas it forms diamagnetic octahedral complex with strong ligands.      2

15.	Give the name, stereochemistry and the magnetic behavior of the following complexes. i) $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$ ii) $\text{K}_2[\text{Ni}(\text{CN})_4]$	2
16.	a) State the hybridisation and magnetic behavior of $[\text{Cr}(\text{CO})_6]$ b) What are the factors affecting crystal field splitting energy? c) Which of the following is more stable and why? $\text{K}_4[\text{Fe}(\text{CN})_6]$ or $\text{K}_3[\text{Fe}(\text{CN})_6]$	3
17.	Draw a sketch to show the splitting of d-orbitals in an octahedral crystal field. State how the magnitudes of $\Delta_0$ and P decide the actual configurations of the d-orbitals in an octahedral crystal field for a $d^6$ ion.	3
18.	a) Give the IUPAC name of $[\text{CrCl}_2(\text{H}_2\text{O})_4]\text{Cl}$ b) Give the number of unpaired electrons in the following complex ions. $[\text{FeF}_6]^{4-}$ and $[\text{Fe}(\text{CN})_6]^{4-}$ c) Name the isomerism exhibited by the following pair of coordination compounds. $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$ and $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Br}$ Give one chemical test to distinguish between these two compounds.	3
19.	a) Give the electronic configuration of the d orbitals of Ti in $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ ion in an octahedral crystal field. b) Why is this complex coloured? Explain on the basis of distribution of elements in the d orbitals. c) How does the colour change on heating $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ ion?	3
20.	$\text{CoSO}_4\text{Cl}\cdot 5\text{NH}_3$ exists in two isomeric forms A and B. Isomer A reacts with $\text{AgNO}_3$ to give a white precipitate, but does not react with $\text{BaCl}_2$ . Isomer B gives a white precipitate with $\text{BaCl}_2$ but does not react with $\text{AgNO}_3$ . Answer the following questions. i) Identify A and B and write their structural formulae. ii) Name the type of isomerism involved. iii) Give the IUPAC name of A and B.	3
21.	Write the types of isomerism exhibited by the following complexes. i) $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{SO}_4$ ii) $[\text{Co}(\text{en})_3]^{3+}$ iii) $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$	3
22.	Describe the limitations of valence bond theory and Crystal Field theory.	3
23.	Compare the following complexes with respect to their molecular shape and magnetic behavior: i) $[\text{Cr}(\text{NH}_3)_6]^{3+}$ ii) $[\text{Fe}(\text{CN})_6]^{4-}$ iii) $[\text{Ni}(\text{Cl})_4]^{2-}$	3
24.	Three geometrical isomers are possible for $[\text{Co}(\text{en})(\text{H}_2\text{O})_2(\text{NH}_3)_2]^{3+}$ . Draw molecular structures of these three isomers and indicate which one of them is chiral.	3
25.	a) A metal ion $\text{M}^{n+}$ having $d^4$ valence electronic configuration combines with three didentate ligands to form a complex compound. Assuming $\Delta_0 > P$ . i) Draw the diagram showing d-orbital splitting during the complex formation. ii) Write the electronic configuration of the valence electrons of the metal $\text{M}^{n+}$ ion in terms of $t_{2g}$ and $e_g$ . iii) What type of hybridization will $\text{M}^{n+}$ ion have	3

