

11. COORDINATION CHEMISTRY

Name _____

Lab Section: Day _____ Time _____

1. Give the systematic (IUPAC) names for the following coordination compounds:
 - a. $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}$
 - b. $\text{K}_3[\text{Fe}(\text{CN})_6]$
 - c. $[\text{Cr}(\text{en})_3]\text{Cl}_3$
 - d. $[\text{Co}(\text{H}_2\text{O})_6]\text{F}_2$
 - e. $[\text{Pt}(\text{NH}_3)_5\text{Br}]\text{Cl}_3$
2. How many structural isomers are in the following species? Draw each geometric isomer (with proper projections).
 - a. $[\text{Co}(\text{NH}_3)_2\text{Cl}_4]^-$
 - b. $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$
3. What factors for a metal complex determine whether a given complex will be diamagnetic or paramagnetic?
4. Transition metal complexes containing CN^- ligands are often yellow in color, whereas those containing H_2O ligands are often green or blue. Explain this phenomenon.

5. The $[\text{Ni}(\text{CN})_4]^{-2}$ ion, which has a square-planar geometry, whereas the $[\text{NiCl}_4]^{-2}$ ion, which has a tetrahedral geometry. Show the crystal field splitting diagrams (with d-orbital labels) for these two complexes and determine the magnetism (paramagnetic or diamagnetic) for each.
6. The absorption maximum for the complex ion $[\text{Co}(\text{NH}_3)_6]^{+3}$ occurs at 410 nm. Predict the color of this complex. Explain your reasoning.
7. Write the Lewis structure of each and state whether the following are mono-dentate or bidentate ligands.
- $\text{C}_2\text{O}_4^{-2}$ (oxalate ion)
 - CN
 - $\text{H}_2\text{NCH}_2\text{CH}_2\text{NH}_2$ (ethylenediamine)
 - CO_3^{2-}
8. What is the oxidation number and the coordination number of cobalt in the following complex ions?

Complex Ion	Metal; Oxidation Number	Number of d-electrons	Coordination Number
$[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^{+1}$			
$[\text{Co}(\text{H}_2\text{O})_3\text{CN}]^{+1}$			
$[\text{Co}(\text{en})_3]^{+2}$			