系所組：化學系應用化學碩士班

日期節次：101 年 3 月 17 日第 3 節 13:00~14:30

科目：無機化學

M-3-1

1. Predict and draw the structure and identify the point group for each of the following:
   (a) ClF_5 (b) $NiCl_4^{2-}$ (c) ICl_4^- (d) trans-$CoCl_4F_2^{3-}$. 20%

2. Starting with $[PtCl_4^{2-}]$ give stepwise syntheses of all the isomers of $[PtI(NH_3)Cl_2]^{1-}$. 10%

3. Give an explanation for the difference in observed rate constants for the following two reactions: 10%
   $[Fe(H_2O)_6]^{2+} + Cl^- \rightarrow [Fe(H_2O)_5Cl]^{1+} + H_2O \quad K=10^6 M^{-1}sec^{-1}$
   $[Os(H_2O)_6]^{2+} + Cl^- \rightarrow [Os(H_2O)_5Cl]^{1+} + H_2O \quad K=10^{-2} M^{-1}sec^{-1}$

4. Which ion will exhibit Jahn-Teller distortion when located in an octahedral site (high spin) ? Fe^{3+}, Cr^{3+}, Mn^{3+}, Ti^{3+} 10%

5. Determine the metal-metal bond order consistent with the 18-electron rule for the following:
   a. $[(\eta^5\text{-}C_5H_5)W(CO)_2]_2$ b. $[(\eta^5\text{-}C_5H_5)Ru(CO)_2]_2$. 10%

6. Find the number of unpaired electrons, magnetic moment, and ligand field stabilization energy for each of the following complexes:
   a. $Rh(H_2O)_6^{2+}$ b. $Fe(CN)_6^{3-}$ c.$CuCl_6^{4-}$. 30%

7. Give chemical formulas for 10%
   a. triaquadichloromethylaminecobalt(III)
   b. sodium diamminebis(oxalate)rhenium(III).