

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) $\text{trans-CoCl}_4\text{F}_2^{3-}$. 20%

2. Starting with $[\text{PtCl}_4^{2-}]$ give stepwise syntheses of all the isomers of $[\text{Pt}(\text{NH}_3)\text{Cl}_2]^{1-}$. 10%

3. Give an explanation for the difference in observed rate constants for the following two reactions: 10%

$$[\text{Fe}(\text{H}_2\text{O})_6]^{2+} + \text{Cl}^- \rightarrow [\text{Fe}(\text{H}_2\text{O})_5\text{Cl}]^{1+} + \text{H}_2\text{O} \quad K=10^6\text{M}^{-1}\text{sec}^{-1}$$

$$[\text{Os}(\text{H}_2\text{O})_6]^{2+} + \text{Cl}^- \rightarrow [\text{Os}(\text{H}_2\text{O})_5\text{Cl}]^{1+} + \text{H}_2\text{O} \quad K=10^{-2}\text{M}^{-1}\text{sec}^{-1}$$

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. $[(\eta^5\text{-C}_5\text{H}_5)\text{W}(\text{CO})_2]_2$ b. $[(\eta^5\text{-C}_5\text{H}_5)\text{Ru}(\text{CO})_2]_2$. 10%

6. Find the number of unpaired electrons, magnetic moment, and ligand field stabilization energy for each of the following complexes:
 - a. $\text{Rh}(\text{H}_2\text{O})_6^{2+}$ b. $\text{Fe}(\text{CN})_6^{3-}$ c. CuCl_6^{4-} . 30%

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