淡江大學八十九學年度碩士班招生考試試題

系別：化學學系　　科目：無機化學

TEN POINTS FOR EACH QUESTION

1. Predict the shapes for the following:

   a) $[ICl_4]^-$ b) $[CoCl_4]^{2-}$ c) $[Ni(CO)_4]$ d) NO_2

2. Using Slater's rules, determine Z^* for a *4s* and *3d* electron of **Cu**. Which type of electron is more likely to be lost when copper forms a positive ion?

3. PCl_5 is a stable molecule, but NCl_5 is not. Explain.

4. Draw and determine the point groups of the following atomic orbitals.

   a) p_z b) d_{z2} c) d_{xy}

5. Prepare a molecular orbital energy level diagram for **NO**, showing clearly how the atomic orbitals interact to form MOs. Predict the bond order of **NO** and NO^+ and the number of unpaired electrons.

6. **CsI** is much soluble in water than **CsF**, and **LiF** is much less soluble than **LiI**, Why?

7. $[Co(H_2O)_6]^{3+}$ is a strong oxidizing agent that will oxidize water, while $[Co(NH_3)_6]^{3+}$ is stable in aqueous solution. Explain this difference.

8. Sketch all isomers of the following:

   a) $[Pt(NH_3)_3Cl_3]^+$ b) **Fe(oxalate)**$_3]^{3-}$ c) $[Pt(NH_3)_2Cl_2]$

9. The high spin d^4 complex ion $[Cr(H_2O)_6]^{2+}$ is labile, but the low spin d^4 complex ion $[Cr(CN)_6]^{4-}$ is inert. Explain.

10. Draw structure for the following:

a)Ferrocene b)Metalloporphyrin c)Ziegler-Natta catalyst d)Wilkinson complex