淡江大學九十二學年度碩士班招生考試試題

系別：化學學系　　　　　　科目：無　機　化　學

准帶項目請打「○」否則打「×」
簡單型計算機
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1.按照題目順序作答 2.儘量詳細的把推理及思考的過程書寫清楚 3.每題十分

1. Estimate the magnetic moment (spin contribution only) of each of the following ions: (a)$[FeF_6]^{3-}$ (b)$[Ni(CN)_4]^{2-}$ (c) $[Fe(CN)_6]^{3-}$.

2. Would the $[Cu(CN)_4]^{3-}$ ion to be expected to be (a) square planar or tetrahedral? (b) colored or colorless? Explain.

3. Show diagrammatically the splitting of d orbitals, energywise, in (a) octahedral (b) tetrahedral and (c) square planar fields.

4. Arrange the following complexes in order of increasing lability: (a) $[Fe(H_2O)_6]^{3+}$ (b) $[Cr(H_2O)_6]^{3+}$ (c) $[Al(H_2O)_6]^{3+}$.

5. Propose a formula and structure for an iron carbonyl complex of cyclobutadiene. Show that the 18-electron rule and polyhedral cluster rules are obeyed.

6. Derive the complete term symbols for a carbon atom in ground state.

7. Explain the sharp drop in <u>single bond</u> energy between C-C (83kcal/mole) and N-N (38 kcal/mole).

8. Nitrosyl fluoride has the formula FNO. (a) Draw the Lewis structure for this compound. (b) Indicate what hybrid orbital is involved around the nitrogen atom. (c) Critically discuss the expected magnitude of the FNO bond angle.

9. Give and explain the detailed stereochemistry of the following species: SO_3^{2-} and ICl_3. In what point group does it belong?

10. The ionic radius of sulfide (S^{2-}) is 1.83A°. CaS takes a rock salt structure. Calculate the ionic radii of calcium ion (Ca^{2+}). What is the coordination numbers of calcium and sulfide?