

# 淡江大學八十八學年度碩士班招生考試試題

系別：化學學系

科目：無機化學

本試題共 1 頁

## Inorganic Chemistry Examination

1. Briefly definition the following terms: (20%)
  - (1) Enantiomer
  - (2) Crystal field stabilization energy
  - (3) Lanthanide contraction
  - (4) Hypervalent compounds
  - (5) Jahn-Teller effect of ligand field
  - (6) Carbene and carbyne metal complexes
  - (7) Synergic bonding of M-CO
  - (8) Mixed-valence metal compounds
  - (9) Linkage isomer of metal complexes.
  - (10) Electron affinity and ionization potentials
  
2. Give the molecular structures for the following molecules and ions.(20%)
  - (11)  $\text{SO}_4^{2-}$ ,  $\text{S}_2\text{O}_3^{2-}$ ,  $\text{S}_4\text{O}_6^{2-}$ ,  $\text{S}_2\text{O}_8^{2-}$ , and  $\text{S}_2\text{O}_6^{2-}$
  - (12)  $\Delta$ - $[\text{Co}(\text{en})_3]^{2+}$  and  $\Lambda$ - $[\text{Co}(\text{en})_3]^{2+}$ , (en = ethylenediamine)
  - (13) Give five isomers for  $\text{Fe}_3(\text{CO})_{12}$
  - (14)  $\text{S}_3\text{N}_3^-$  and  $\text{S}_2\text{N}_2$
  
3. Describe the reasons for the following terms: (20%)
  - (15) In solid state,  $\text{Ni}(\text{CN})_4^{2-}$  is diamagnetism, whereas  $\text{Ni}(\text{H}_2\text{O})_6^{2+}$  is paramagnetism.
  - (16) Why the elements of Cr and Mn atoms have high oxidation number of
  - (17) 7+, and the Ni and Cu atoms have oxidation number limit at +4 **or** +3 ?
  - (18) Why Cu(II) and Mn(III) ions prefer to form the five-coordination complexes with  $C_{4v}$  symmetry ?
  - (19) Why  $\text{Ru}(\eta^5\text{-C}_5\text{H}_5)_2$  is more stable than  $\text{Rh}(\eta^5\text{-C}_5\text{H}_5)_2$ ?
  
4. Describe the outer sphere and inner sphere electron-transfer mechanisms in metal complexes, and to give the factors affect these two mechanisms. (20%)
  
5. Identify the electronic ground-state terms in free ions and in cubic octahedral  $O_h$  crystal field (high-spin) with  $d^2$ ,  $d^3$ ,  $d^4$ , and  $d^5$  configuration (hint:  $d^0 : ^2D$  in free ion,  $^2E_g$  in  $O_h$ ) (20%)