

淡江大學 100 學年度碩士班招生考試試題

25

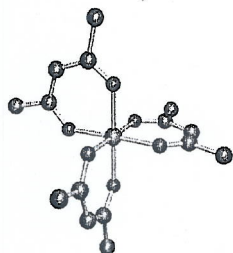
系別：化學學系(化學組)

科目：無機化學

考試日期：2月28日(星期一) 第3節

本試題共 8 大題， 1 頁

1. (20 pts) The following is the structure of $[\text{Cr}(\text{acac})_3]$ ([acac] : acetylacetonate).
 (a) Find all possible symmetry elements belong to the structure.
 (b) Assign a point group to the structure based on symmetry elements found in (a).
 (c) Is it chiral? If yes, give its chiral sense.



2. (10 pts) Construct the molecular orbital energy diagram of HF.
 3. (10 pts) Give a general catalytic cycle for Pd catalyzed C-C cross coupling reactions. Indicate the reactions involved.
 4. (10 pts) Rationalize the data shown below:

Complex	$\text{Ni}(\text{CO})_4$	$[\text{Co}(\text{CO})_4]^-$	$[\text{Fe}(\text{CO})_4]^{2-}$
$\bar{\nu}_{\text{CO}} / \text{cm}^{-1}$	2060	1890	1790

5. (20 pts) (a) Why is Δ_{tet} generally smaller than Δ_{oct} ?
 (b) Draw d-orbital energy diagrams for (1) an octahedral complex (ML_6) with elongation along z axis and (2) a square-planar complex (ML_4). Give the relative energy for the two. Rationalize your answers.
 6. (10 pts) For $\text{C}_{60}\text{F}_{16}$, is the C_{60} spherical? Explain your answer.
 7. (10 pts) How many chelate rings are present in each of the following complexes? Assume all the donor atoms are involved in coordination. Also, give the structure of each ligand.
 (a) $[\text{Ru}(\text{bpy})_3]^{2+}$; (b) $[\text{K}(\text{18-crown-6})]^+$.
 8. (10 pts) The following potential diagram summarizes some of the redox chemistry of iron in aqueous solution. Calculate the value of E^0 for the reduction of $\text{Fe}^{3+}(\text{aq})$ to iron metal.

