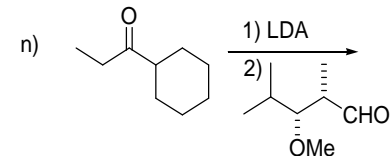
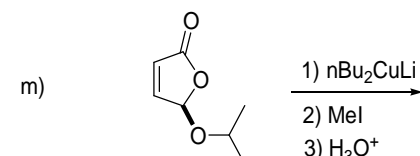
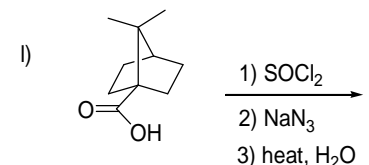
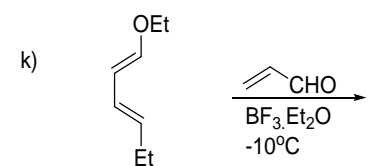
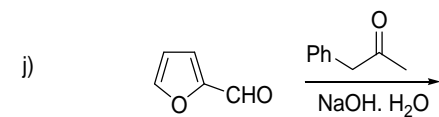
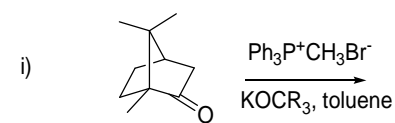
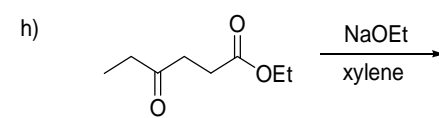
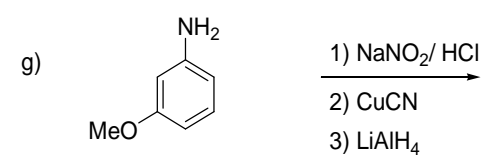
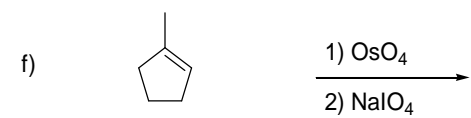
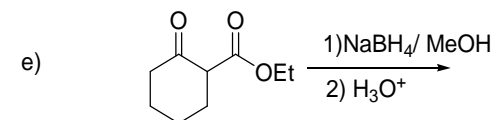
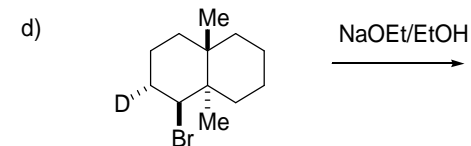
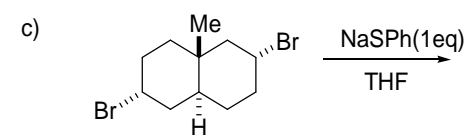
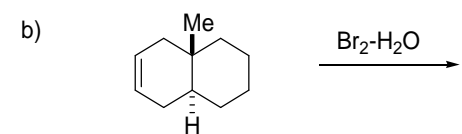
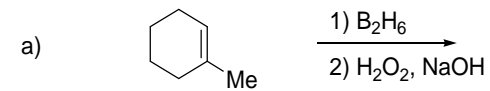


# 國立嘉義大學九十七學年度 應用化學系碩士班(甲組)招生考試試題

科目：綜合化學 I

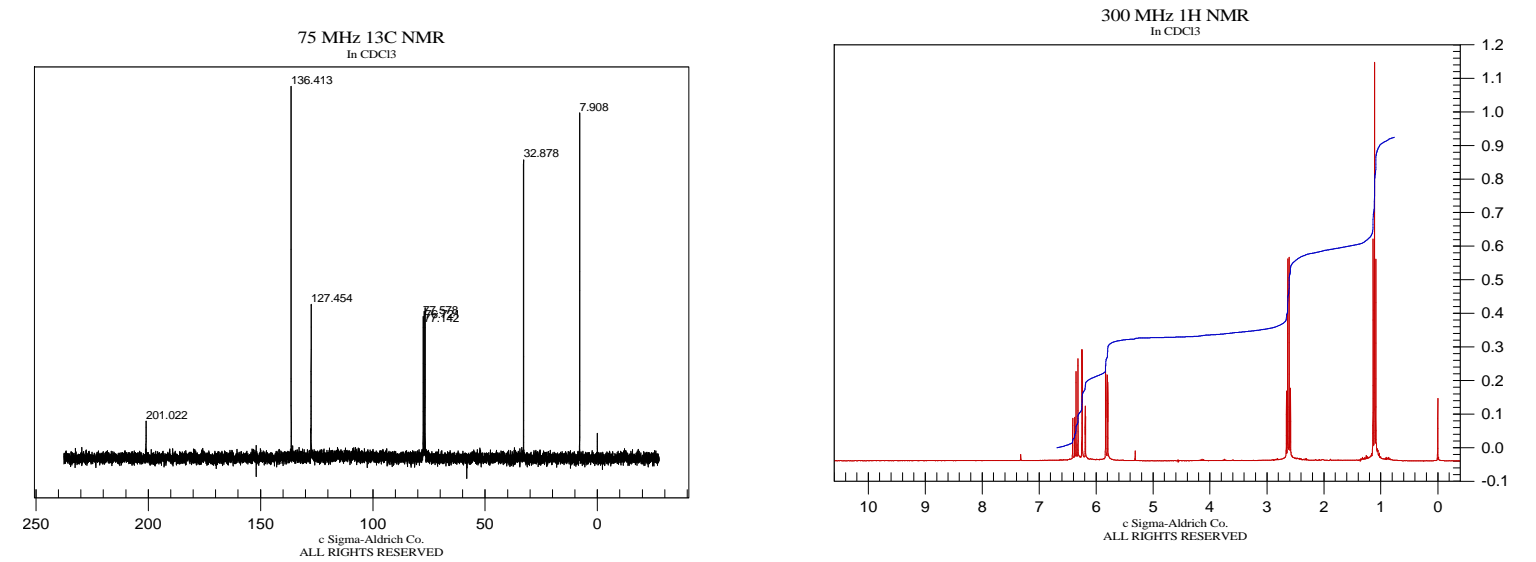
Part I: 有機化學

1) 請完成以下之反應(每題 2.5 分，共 35 分)

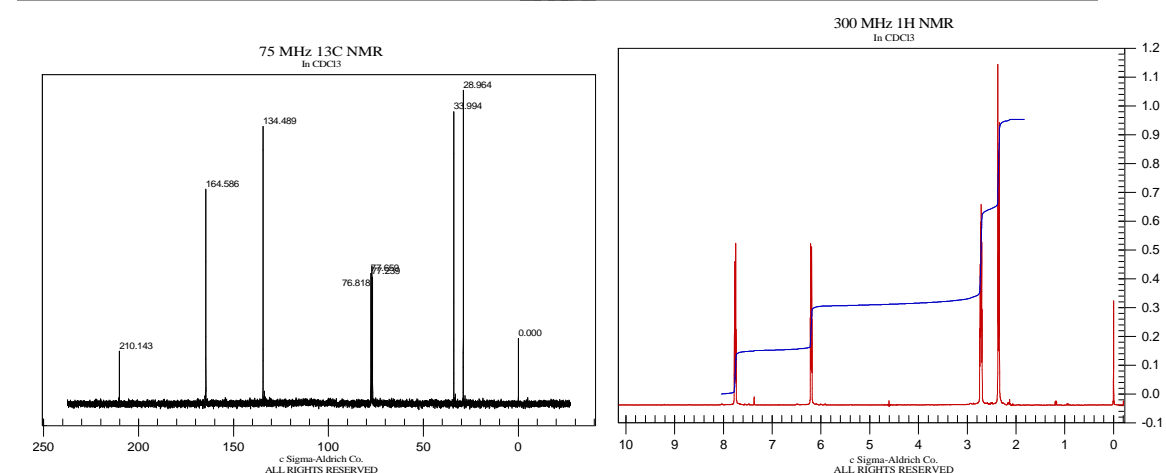
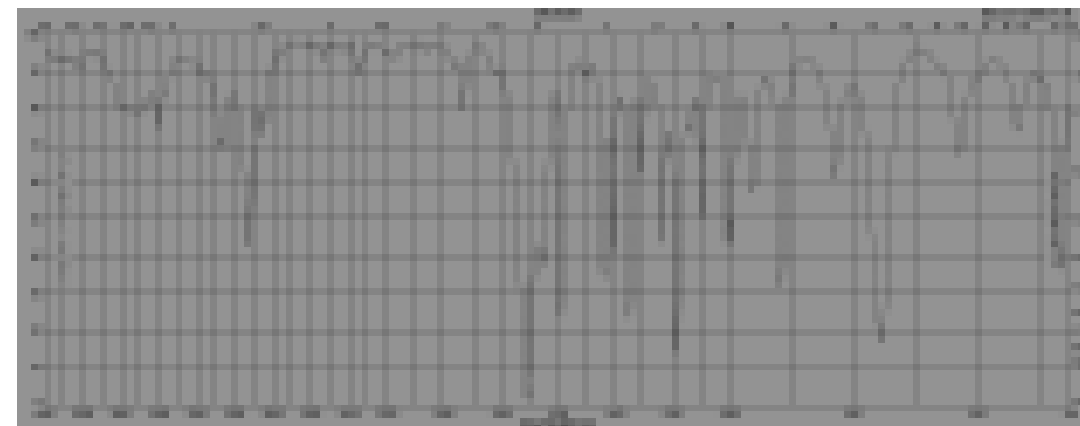


3) 請利用提供之光譜資料解析未知物之結構。(每題 5 分，共 10 分)

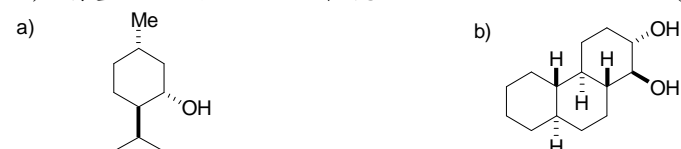
a) 未知物具  $\text{C}_5\text{H}_8\text{O}$  分子式，其碳-13 及氫-1 NMR 如下(碳譜 77ppm 左右之 peak 可忽略):



b) 未知物含 C, H, O 其 M.W.=82，其 IR 及 NMR 資料如下(碳譜 77ppm 左右之 peak 可忽略):



2) 請畫出以下化合物最穩定之 conformation。(每題 2.5 分，共 5 分)



背面尚有試題

## Part II: Inorganic Chemistry

1. (5 points) The history of inorganic chemistry.

2. (15 points) For  $\text{BF}_3$ :

(a) Show clearly how the atomic orbitals interact to form MOs.

(including setup of reducible representation, irreducible representation, molecular shapes of interactions and energy level diagram)

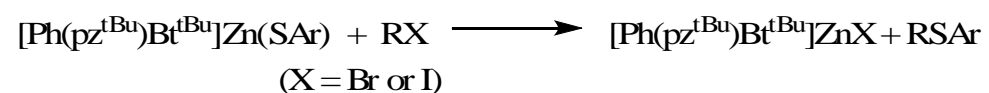
(b) Use projection operation method to give wavefunctions.

3. (5 points) Predict the order of solubility in water of each of the following series and explain the factors involved:

(a)  $\text{MgSO}_4$     $\text{CaSO}_4$     $\text{SrSO}_4$     $\text{BaSO}_4$

(b)  $\text{PbCl}_2$     $\text{PbBr}_2$     $\text{PbI}_2$     $\text{PbS}$

4. (10 points) The reaction of zinc-thiolate complex and alkyl halide is the reaction model of the enzyme, methionine synthase. The formula and kinetic data are shown as below:



$[\text{Ph}(\text{pz}^{\text{tBu}})\text{Bt}^{\text{tBu}}]\text{ZnSAr}$	$k_2, \text{M}^{-1}\cdot\text{s}^{-1}$ 25 °C	$\Delta H^\ddagger$ kcal/mol	$\Delta S^\ddagger$ cal/mol-K
$[\text{Ph}(\text{pz}^{\text{tBu}})\text{Bt}^{\text{tBu}}]\text{ZnSPh}$	$2.1 \times 10^{-4}$	$16.1 \pm 1.4$	$-21.7 \pm 3.8$
$[\text{Ph}(\text{pz}^{\text{tBu}})\text{Bt}^{\text{tBu}}]\text{Zn}(\text{SC}_6\text{H}_4\text{o-NHC(O)Bu}^t)$	$6.2 \times 10^{-6}$	$18.5 \pm 1.0$	$-20.7 \pm 2.6$
$[\text{Ph}(\text{pz}^{\text{tBu}})\text{Bt}^{\text{tBu}}]\text{Zn}(\text{SC}_6\text{H}_4\text{o-NDC(O)Bu}^t)$	$1.5 \times 10^{-5}$	$16.9 \pm 1.0$	$-23.9 \pm 2.9$
$[\text{Ph}(\text{pz}^{\text{tBu}})\text{Bt}^{\text{tBu}}]\text{ZnSPh}^*$	$5.8 \times 10^{-5}$	$16.7 \pm 1.0$	$-21.5 \pm 2.7$

\*Alkylation by  $\text{CH}_3\text{I}$ . (*PNAS* **2003**, *100*, 3695)

Based on the data, please predict the mechanism of the reaction. (Discuss all factors)

5. (5 points) What are the possible magnetic moment of Co(II) in Td, Oh, and square-planar complex?

6. (5 points) The smallest “nanocrystal” of a salt is the unit in which all of the ions are adequately neutralized, i.e. at least 60% of the coordination sphere of each ion is complete. A residual charge of +1 or -1 is usually present. Draw the smallest nanocrystal of NaCl and give its formula.

7. (5 points) Predict the products of the following reactions.

(a)  $[\text{Pt}(\text{CO})\text{Cl}_3]^- + \text{NH}_3$    (b)  $[\text{Pt}(\text{NH}_3)\text{Br}_3]^- + \text{NH}_3$