

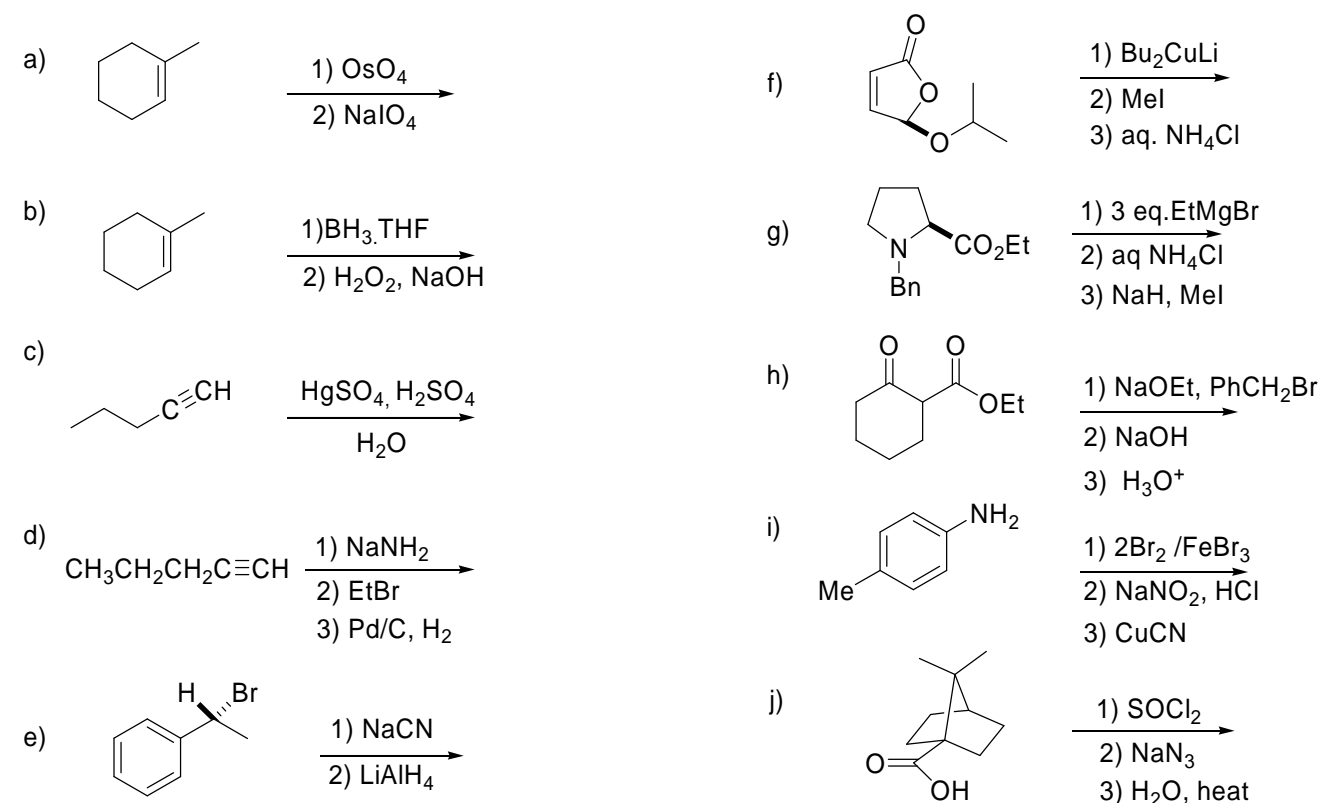
國立嘉義大學 99 學年度

應用化學系碩士班 (甲組) 招生考試試題

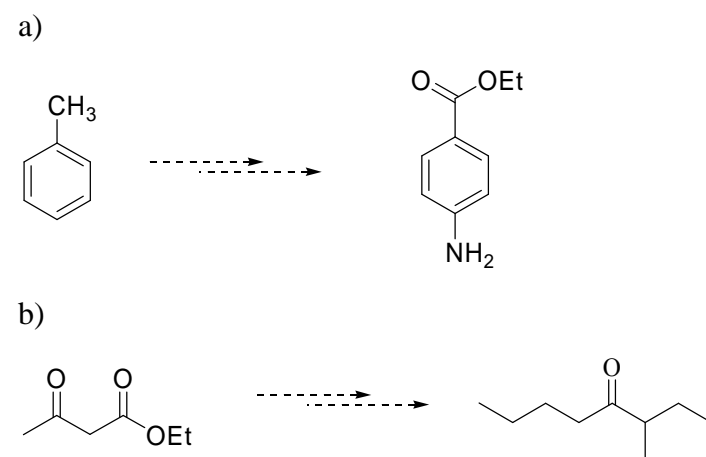
科目：綜合化學 I

一、有機化學 (50 分)

1. Please complete the following reactions by giving the major product, with correct stereochemistries if applicable. (30 points, 3 points for each reaction)

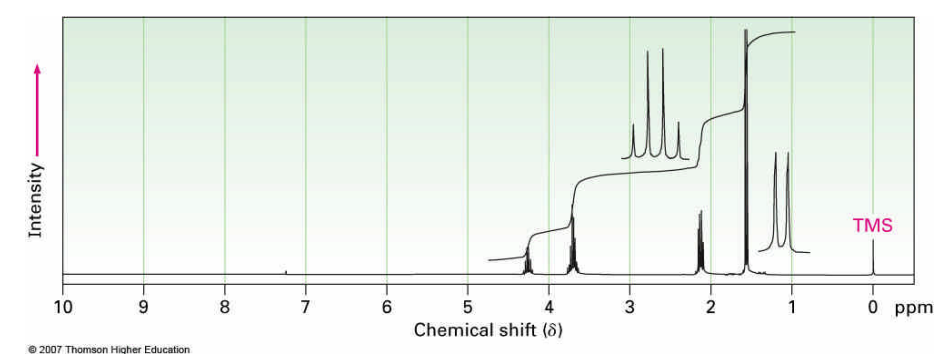


2. Please complete the following syntheses, starting from the giving starting material. Write out all the needed reagents and transformed products. (10 points, 5 points for each synthesis)

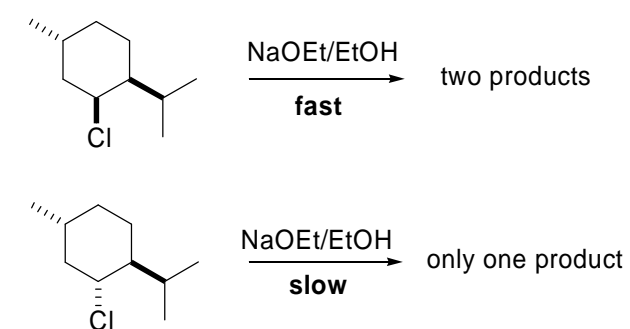


3. Please answer the following questions; (10 points)

a) An unknown compound with formula **C₄H₈Cl₂**, Please solve the structure using the following ¹HNMR spectrum. (5 points)



b) Please explain the following observations :



(1) Draw the corresponding products. (3 points)

(2) Why there is difference in reaction rates between these two reactions ? (2 points)

二、無機化學 (50 分)

1. Using the Molecular Orbital to calculate the bond order of the following molecules: O_2^+ , O_2^{-1} , B_2 , NO and predict which molecule(s) is(are) paramagnetic? (8points)

	Bond Order	Paramagnetic or Diamagnetic
O_2^+	_____	_____
O_2^{-1}	_____	_____
B_2	_____	_____
NO	_____	_____

2. Draw the three possible geometric structures of BrF_3 and explain which is the most favorable structure? (6 points):

3. The $4f_z(x^2-y^2)$ orbital has the angular function $Y=(\text{constant})z(x^2-y^2)$.

- (a) How many angular nodes does it have? Describe the angular nodal surfaces.
 (b) How many spherical nodes does it have? Explain your reasons. (8 points)

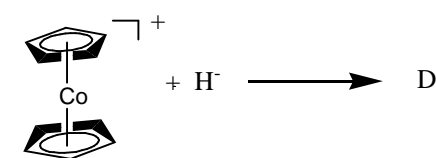
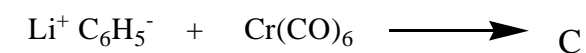
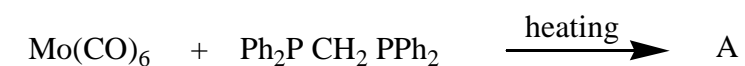
4. **Choose and explain:** (6 points)

- (a) Strongest Bronsted acid : SnH_4 SbH_3 TeH_2
 (b) Strongest Base to H^+ (gas phase): NH_3 CH_3NH_2 $(CH_3)_2NH$ $(CH_3)_3N$
 (c) Strongest Base to BMe_3 : Pyridine 2-methylpyridine 4-methylpyridine

5. Predict the number of unpaired electrons for each of the following: (8 points)

- (a) a tetrahedral d^6 ion
 (b) $[Co(H_2O)_6]^{2+}$
 (c) $[Cr(H_2O)_6]^{3+}$
 (d) a square-planar d^7 ion

6. Predict the **MAJOR** product of the following reactions: (8 points)



7. Which of the complexes has the **lowest** energy of CO stretching frequency in the IR region(6 points)? **give the explanations.**

