

國立成功大學  
110學年度碩士班招生考試試題

編 號：77

系 所：化學工程學系

科 目：有機化學

日 期：0203

節 次：第 1 節

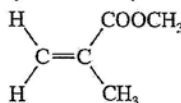
備 註：不可使用計算機

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

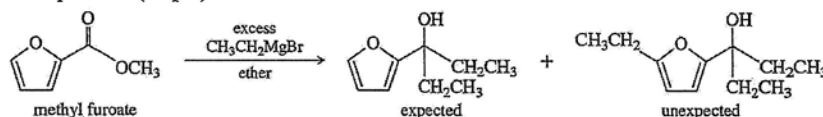
**I. Multiple-choice questions (15 pts)**

- [1] Which of the following compounds will react *least rapidly* when treated with  $\text{CH}_3\text{CH}_2\text{Cl}$  and  $\text{AlCl}_3$ ?  
(A) *o*-xylene (B) acetanilide (C) toluene (D) benzene (E) bromobenzene
- [2] When aldehydes are subjected to the same conditions that  $\alpha$ -halogenate ketones (i.e.,  $\text{X}_2$  and aqueous acid or base), they are \_\_\_\_\_.  
(A)  $\alpha$ -halogenated as well (B) reduced to alcohols (C) converted to the acid halide  
(D) oxidized to the acid or carboxylate (E) esterified
- [3] Which of the following compounds would undergo autoxidation most readily?  
(A) dibenzyl ether (B) MTBE (C) diethyl ether (D) isobutyl phenyl ether
- [4] Which of the following amino acids are classified as essential amino acids? (More than one answer is possible.)  
(A) isoleucine (B) proline (C) tryptophan (D) histidine
- [5] A sample of compound X is subjected to elemental analysis and the following percentages by weight are found: 39.97% C, 6.73% H, and 53.30% O. The molecular weight of X is 90. What is the empirical formula of X?  
(A)  $\text{C}_6\text{H}_8\text{O}_8$  (B)  $\text{C}_2\text{H}_4\text{O}_2$  (C)  $\text{C}_4\text{H}_{10}\text{O}_2$  (D)  $\text{C}_3\text{H}_6\text{O}_3$  (E)  $\text{CH}_2\text{O}$

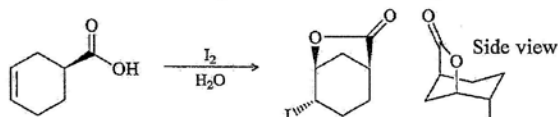
**II. Draw a mechanism for a base-catalyzed polymerization (anionic polymerization) of methyl methacrylate to give the Plexiglas polymer. (10 pts)**



- III. A graduate student added an excess of ethylmagnesium bromide to methyl furoate, expecting the Grignard reagent to add twice and form tertiary alcohol. After water workup, He found that the product was a mixture as indicated below. One was the expected alcohol with two ethyl groups, but the unexpected product had added three ethyl groups. Propose a mechanism to explain the formation of the unexpected product. (10 pts)**



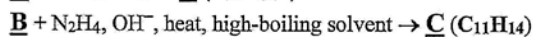
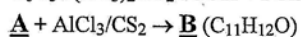
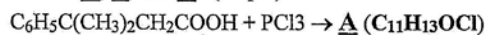
- IV. A graduate student attempted to form the iodohydrin of the alkene shown below, Her analysis of the products showed a good yield of an unexpected product. Propose a mechanism to explain the formation of this unexpected product. (10 pts)**



V. Arrange the following in order of reactivity toward ring nitration. (10 pts)

- (a) benzene; mesitylene (1,3,5- $C_6H_3(CH_3)_3$ ); toluene; *m*-xylene, *p*-xylene  
 (b) terephthalic acid, toluene, *p*-toluic acid, *p*-xylene

VI. (a) What are **A**, **B**, and **C**? (15 pts)



**C** gave the following proton NMR spectrum:

- (i) singlet,  $\delta$  1.22 ppm, 6 H  
 (ii) triplet,  $\delta$  1.85 ppm, 2 H,  $J = 7$  Hz  
 (iii) triplet,  $\delta$  2.83 ppm, 2 H,  $J = 7$  Hz  
 (iv) singlet,  $\delta$  7.02 ppm, 4 H

(b) **C** was also formed by treatment of the alcohol **D** ( $C_{11}H_{16}O$ ) with concentrated sulfuric acid. What is the structure of **D**. (5 pts)

VII. Give the structures of compounds **A** through **H** in the following series of reactions. (25 pts)

