

國立成功大學

113學年度碩士班招生考試試題

編 號：75

系 所：化學工程學系

科 目：有機化學

日 期：0201

節 次：第 1 節

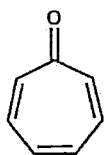
備 註：不可使用計算機

※ 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。

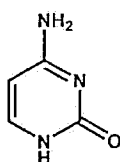
1. Selective questions

1.1. Which molecules are aromatic? (Multiple choices) (2%)

(A)



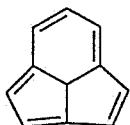
(B)



(C)



(D)

1.2. Why does ethyne ($\text{HC}\equiv\text{CH}$) not show IR absorption in the region $2000\text{--}2500\text{ cm}^{-1}$? (Single choice) (2%)

(A) C—H stretches occur at lower energies

(B) $\text{C}\equiv\text{C}$ stretches occur at about 1640 cm^{-1} (C) there is no change in the dipole moment when the $\text{C}\equiv\text{C}$ bond in ethyne stretches(D) there is a change in the dipole moment when the $\text{C}\equiv\text{C}$ bond in ethyne stretches

1.3. Classify the reaction below as an oxidation, a reduction, or neither. (Single choice) (2%)

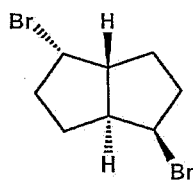
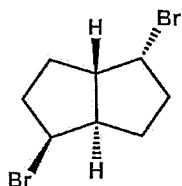
cis-pent-2-ene \rightarrow pentane

(A) oxidation

(B) reduction

(C) neither

1.4. What is the stereochemical relationship between the following compounds? (Single choice) (2%)



(A) Structural isomer

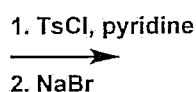
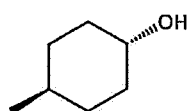
(B) Enantiomer

(C) Diastereomer

(E) They are the same compound

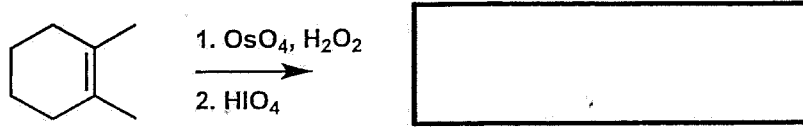
2. Draw the chemical structures of the major products for the following reaction. Include correct stereochemistry if necessary.

2.1. (4%)



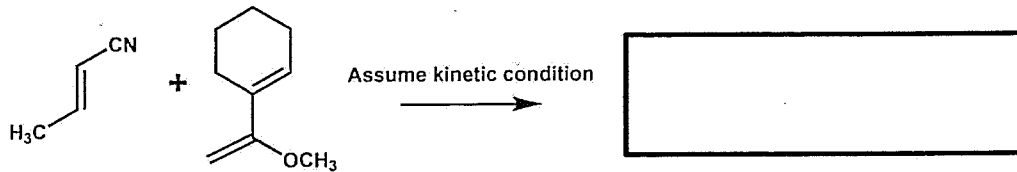
2.2.

(4%)



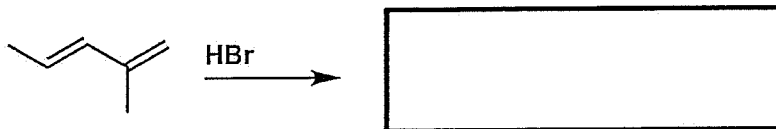
2.3.

(4%)



2.4.

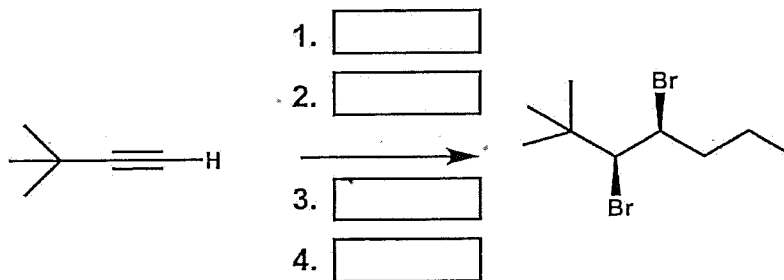
(4%)



3. Complete the following reaction by filling in the necessary reagents or starting compounds.

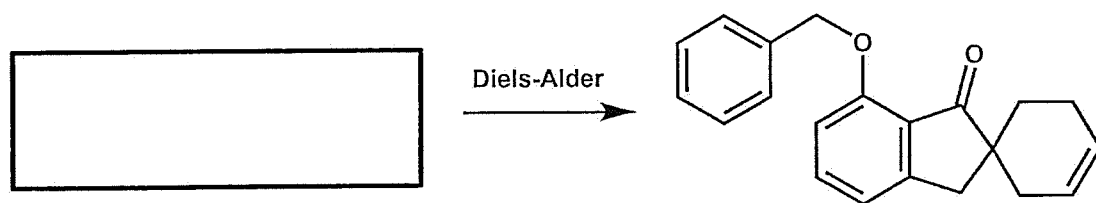
3.1.

(4%)



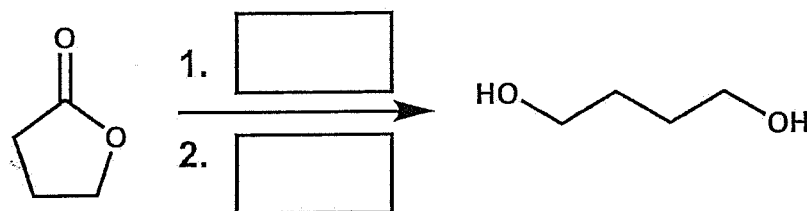
3.2.

(4%)



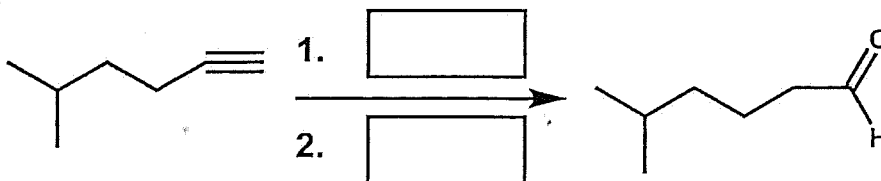
3.3.

(4%)



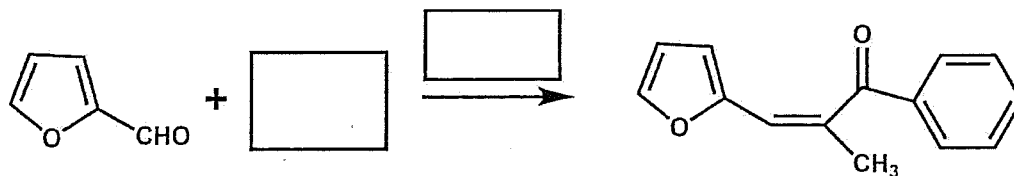
3.4.

(4%)



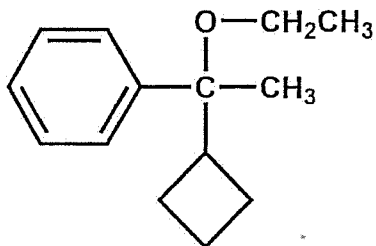
3.5.

(4%)

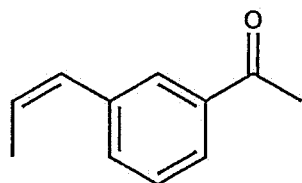


4. Show a series of synthetic steps to prepare the following compounds.

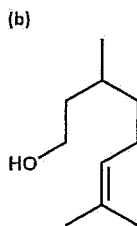
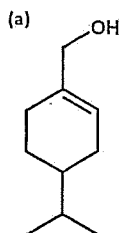
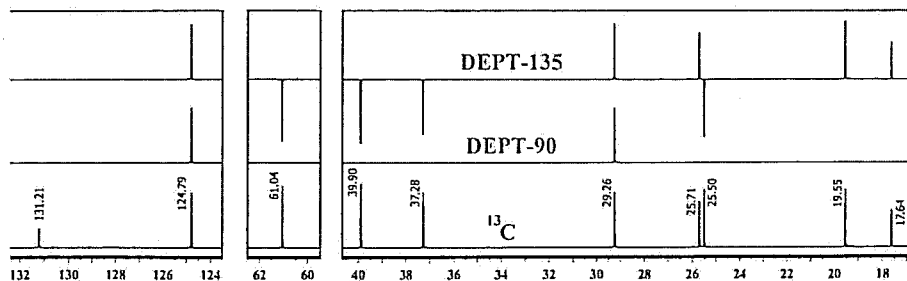
4.1. You may use any starting materials containing no more than six carbon atoms. (5%)



4.2. Starting from benzene and any other reagent needed. (5%)



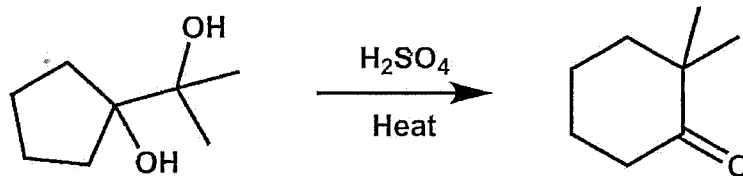
4.3. Which compound (a or b) will have the following DEPT and ^{13}C NMR spectra? Please briefly explain your reason. (5%)



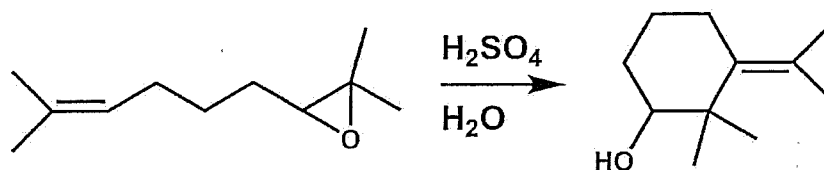
Experiment	C_q	CH	CH_2	CH_3
Normal ^{13}C	+	+	+	+
DEPT-90	0	+	0	0
DEPT-135	0	+	-	+

5. Propose mechanisms for the following reactions.

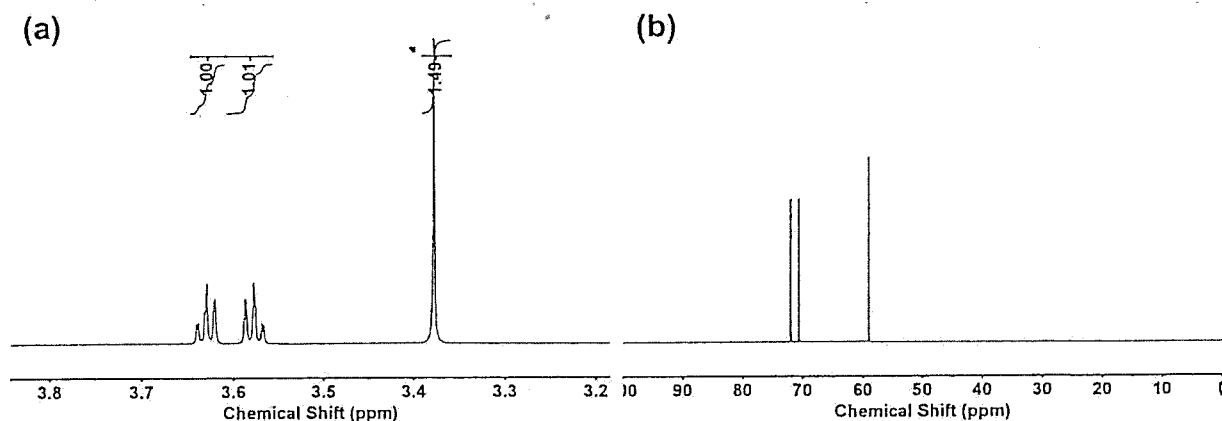
5.1. (10%)



5.2. (10%)

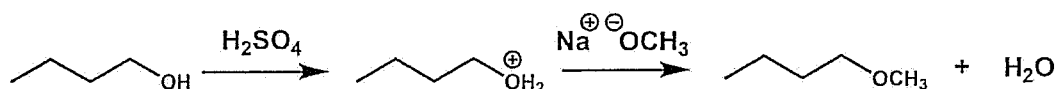


6. An acid-catalyzed reaction was carried out using methyl cellosolve (2-methoxyethanol) as the solvent. When the 2-methoxyethanol was redistilled, a higher-boiling point fraction (bp 162°C) was also recovered. The mass spectrum of this fraction showed the molecular weight to be 134. The IR spectrum of the unknown species only exhibited C-O signal. No O-H signal was found. The NMR spectra are shown here. Determine the structure of this compound, and propose a mechanism for its formation. (10%)



7.

7.1. What is wrong with the following reactions? (5%)



7.2. Provide at least two different syntheses that are more likely to succeed. (6%)