

八十六學年度 化學工程學系 系(所) 乙 組碩士班研究生入學考試

科目 有機化學 科號 1702 共 6 頁第 1 頁 *請在試卷【答案卷】內作答

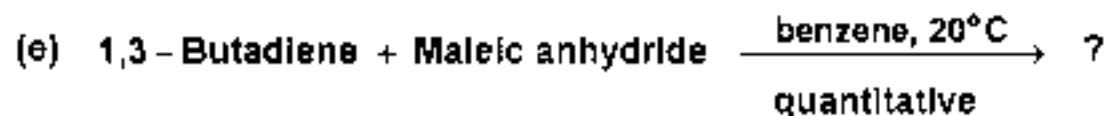
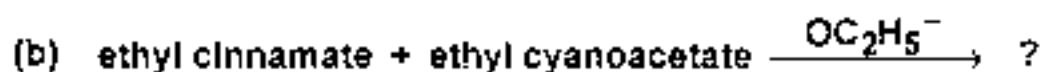
Problem 1 (10%)

Give structures of compounds A through E.



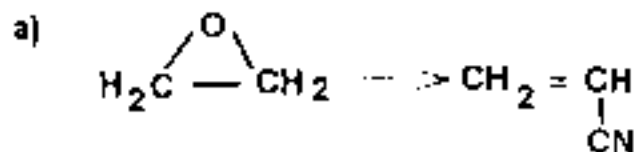
Problem 2 (10%)

Give the structure of the products from the following reactions.



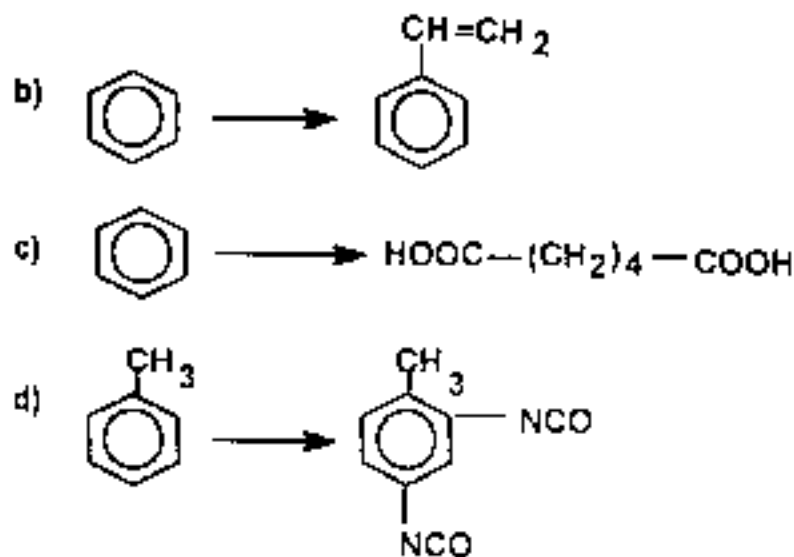
Problem 3 (20%)

Show intermediate reaction steps for the following reactions.



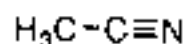
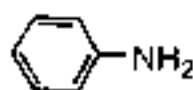
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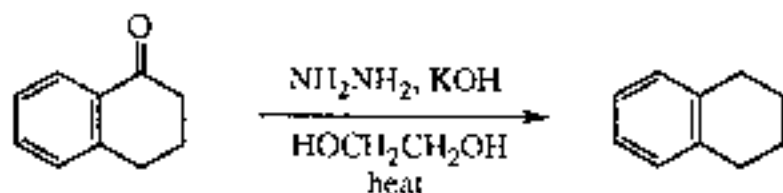
Problem 4 (3%)

Rank the following species in an order of decreasing basicity, and briefly explain your answer



Problem 5 (3%)

Propose a stepwise reaction mechanism for the following transformation.

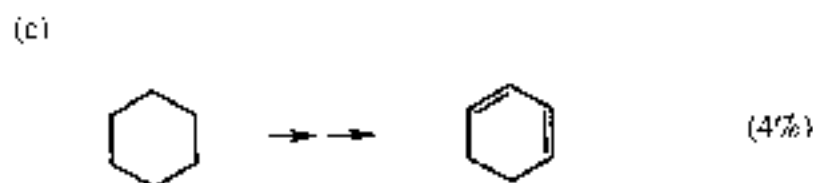
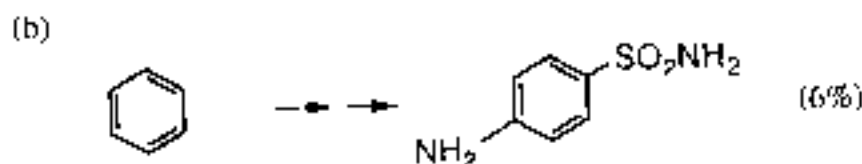
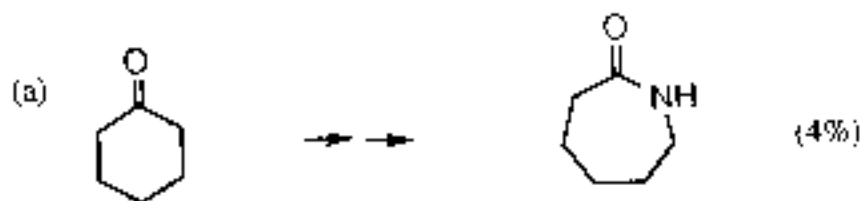


Problem 6 (14%)

Provide necessary reagent(s) to complete each of the following conversions and show all reaction intermediates.

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Problem 7 (20%)

I. 選擇題 (單選題)

- 2% 1. Which of the following cycloalkanes exhibits the greatest molar heat of combustion?
- cyclopropane
 - cyclobutane
 - cyclopentane
 - cyclohexane
 - cycloheptane
- 2% 2. Which of the following is a bridged bicyclic alkane?
- cis-decalin
 - bicyclo[2.2.1]heptane
 - bicyclo[3.2.0]heptane
 - bicyclo[4.1.0]heptane
 - none of the above

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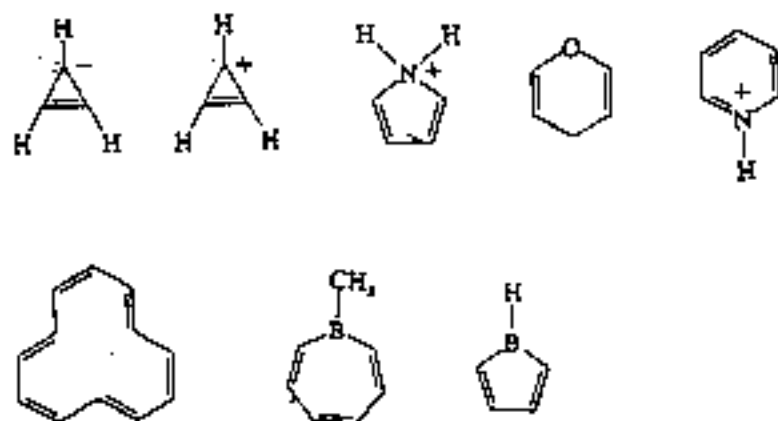
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- 2% 3. Which of the species below is less basic than acetylide?
- CH_3Li
 - CH_3ONa
 - NaOH
 - both b and c
 - all of the above
- 2% 4. Which of the following molecules is chiral?
- 2,3-pentadiene
 - 1,2-pentadiene
 - 2-methyl-2,3-pentadiene
 - 2-chloro-4-methyl-2,3-pentadiene
 - none of the above molecules is chiral
- 2% 5. Consider the equilibrium of each of the carbonyl compounds with HCN to produce cyanohydrins. Which is the correct ranking of compounds in order of increasing K_{eq} for this equilibrium?
- $\text{H}_2\text{CO} < \text{cyclohexanone} < \text{CH}_3\text{CHO} < \text{2-methylcyclohexanone}$
 - $\text{CH}_3\text{CHO} < \text{2-methylcyclohexanone} < \text{cyclohexanone} < \text{H}_2\text{CO}$
 - $\text{cyclohexanone} < \text{2-methylcyclohexanone} < \text{H}_2\text{CO} < \text{CH}_3\text{CHO}$
 - $\text{cyclohexanone} < \text{2-methylcyclohexanone} < \text{CH}_3\text{CHO} < \text{H}_2\text{CO}$
 - $\text{2-methylcyclohexanone} < \text{cyclohexanone} < \text{CH}_3\text{CHO} < \text{H}_2\text{CO}$
- 3% II. Deduce the identity of the following compound from the spectral data given.
 $\text{C}_9\text{H}_{10}\text{O}_2$: ^{13}C NMR, δ 18.06 (quartet), 45.40 (doublet), 127.32 (doublet), 127.55 (doublet), 128.61 (doublet), 139.70 (singlet), 180.98 (singlet); IR, broad 3500-2800, 1708 cm^{-1} .
- 3% III. When deuterated acetone is used as the solvent for ^1H NMR spectroscopy study, a set of quintet signal always appears at δ 2.2. Please explain why?

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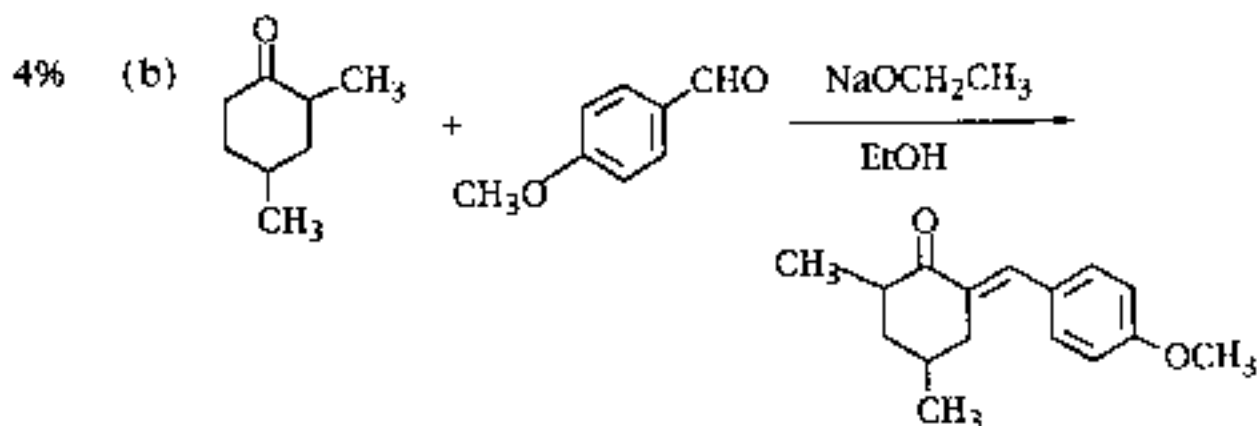
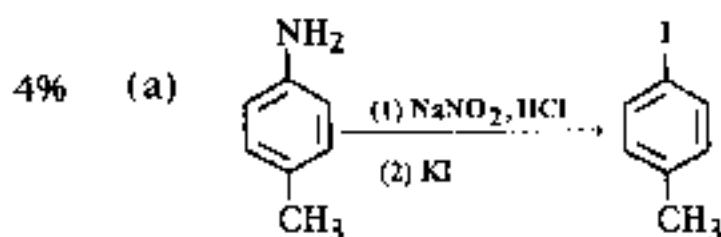
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4% IV. For the following compounds, please classify each as aromatic, antiaromatic, or nonaromatic.



Problem B (20%)

Write stepwise reaction mechanisms for following reactions:



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