

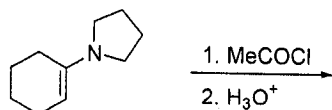
所別：環境工程研究所碩士班 丙組 科目：有機化學

1. 2-Methylhexane shows an intense peak in the mass spectrum at  $m/z = 43$ . Propose a likely structure for this fragment. (10 pts)
2. How could IR spectroscopy be used to distinguish between the following pair of compounds? (10 pts)  
 $\text{CH}_3\text{COCH}=\text{CHCH}_2\text{CH}_3$  and  $\text{CH}_3\text{COCH}_2\text{CH}_2\text{CH}=\text{CH}_2$

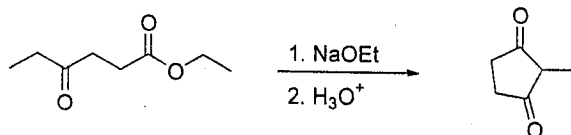
3. What series of synthetic steps could be used to carry out the transformation shown below? (10 pts)



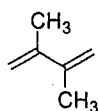
4. Rank the following groups in order of increasing activating power in electrophilic aromatic substitution reactions:  $-\text{OCH}_3$ ,  $-\text{OCOCH}_2\text{CH}_3$ ,  $-\text{CH}_2\text{CH}_3$ ,  $-\text{Br}$ . (10 pts)
5. Provide the major organic product of the reaction shown below. (10 pts)



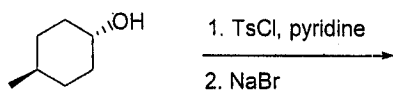
6. Provide a detailed, stepwise mechanism for the transformation shown below. (10 pts)



7. Draw the structure of the major product which results when the diene shown is treated with  $\text{HBr}$  at  $40^\circ\text{C}$ . (10 pts)



8. Which diene reacts more rapidly in Diels-Alder reactions, cyclopentadiene or 1,3-butadiene? Briefly explain your choice. (10 pts)
9. Which of the following compounds absorbs the longest wavelength of UV-visible light? (10 pts)  
 $(E)$ -but-2-ene;  $(Z)$ -but-2-ene; hex-1-ene;  $(Z)$ -1,3-hexadiene;  $(E)$ -1,3,5-hexatriene
10. Provide the major organic product of the following reaction. (10 pts)



參考用