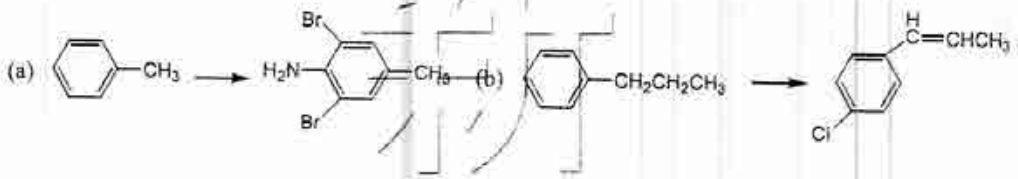
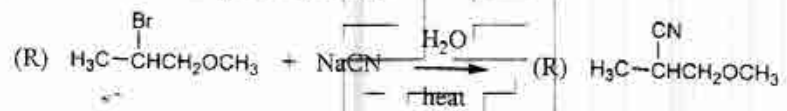
考生注意: 1. 依次序作答,只要標明題號,不必抄題。
2. 答案必須寫在答案卷上,否則不予計分,並限以藍黑色筆作答。
3. 試題隨卷繳回。(詳請詳閱試場規則)

1. Write a flow diagram showing how each of the following conversions could be carried out: (10%, 5% each)



2. The principal component of the sex attractant secretion of the female arctiid moth (*utetheisa ornatrix*) is named (3Z,6Z,9Z)-heneicosatriene. What is the structure of this compound? (5%)

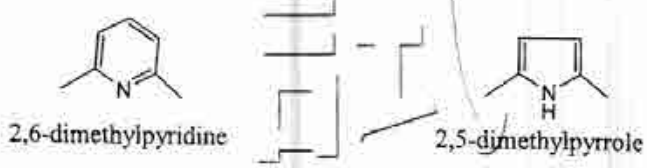
3. Is the stereochemical result given for the following reaction consistent with an S_N2 mechanism? Explain. (10%)



4. Write the equation for the reaction that occurs when each of the following alcohols is treated with HI (show the mechanisms): (10%, 5% each)
(a) 2-propanol (b) 1-butanol

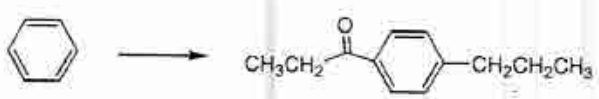
5. A carboxylic acid of the formula $C_3H_5O_2Br$ is optically active. What is its structure? (5%)

6. The basicity of 2,6-dimethylpyridine is much greater than the basicity of 2,5-dimethylpyrrole; the conjugate acid of 2,6-dimethylpyridine has a pK_a=6.43, while the conjugate acid of 2,5-dimethylpyrrole has a pK_a=-0.58. Explain. (10%)

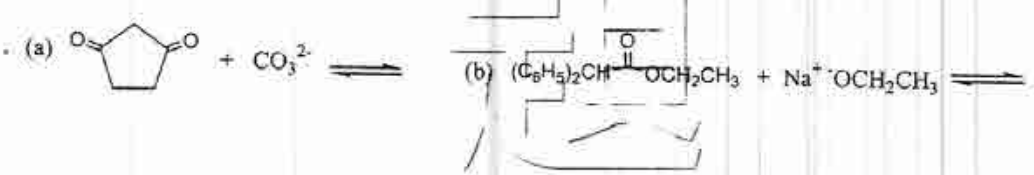


2,6-dimethylpyridine 2,5-dimethylpyrrole

7. Show how the following conversion could be carried out: (10%)



8. Complete the following equations for acid-base reactions: (15%, 5% each)



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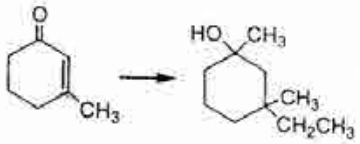
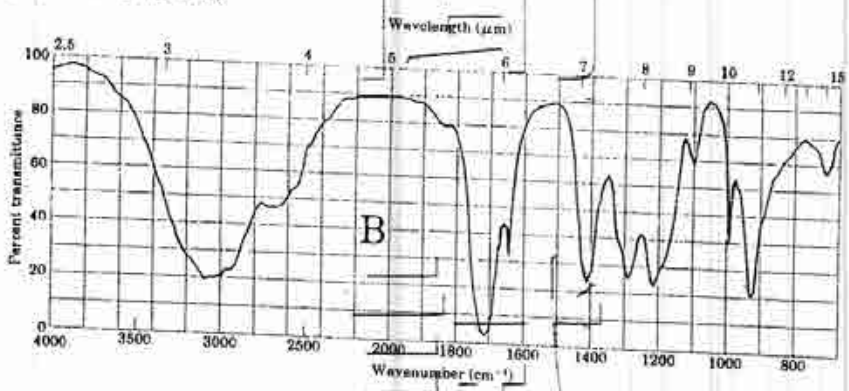
(c) (S) $CH_3CH_2CH_2-\underset{\displaystyle CH_3}{\overset{|}{C}}HCHO$ + OH

9. Using flow equations, show how the following conversions can be carried out. (10%, 5% each)

(a) 

(b) $CH_3CH{=}CHCHCH_3$ (OH) ⟶ $CH_3(CH_2)_3CH(H_3C)-CH_2C(=O)CH_3$

10. A chemist treated Compound A ($C_4H_7O_2Br$) with potassium *tert*-butoxide in *tert*-butyl alcohol. After acidification of the product mixture, the chemist isolated two isomeric products: B and C. The infrared spectrum of B and the ^{1}H NMR spectrum of C are shown below. What are the possible structures of A, B, and C? (15%)



(The offset absorption for C is at δ12.18.)