

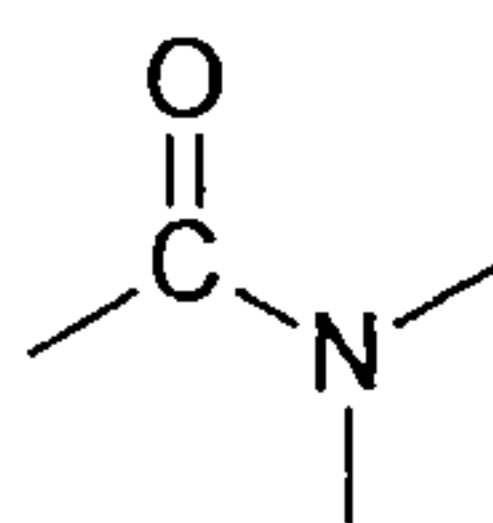
國立清華大學 100 學年度碩士班入學考試試題

系所班組別：生命科學院乙組、醫學生物科技學程

考試科(代碼)：有機化學(0502、0706) 共 5 頁，第 1 頁 *請在【答案卷】作答

Part I. 簡答題 (每題 3%。請在答案卷上依序作答)

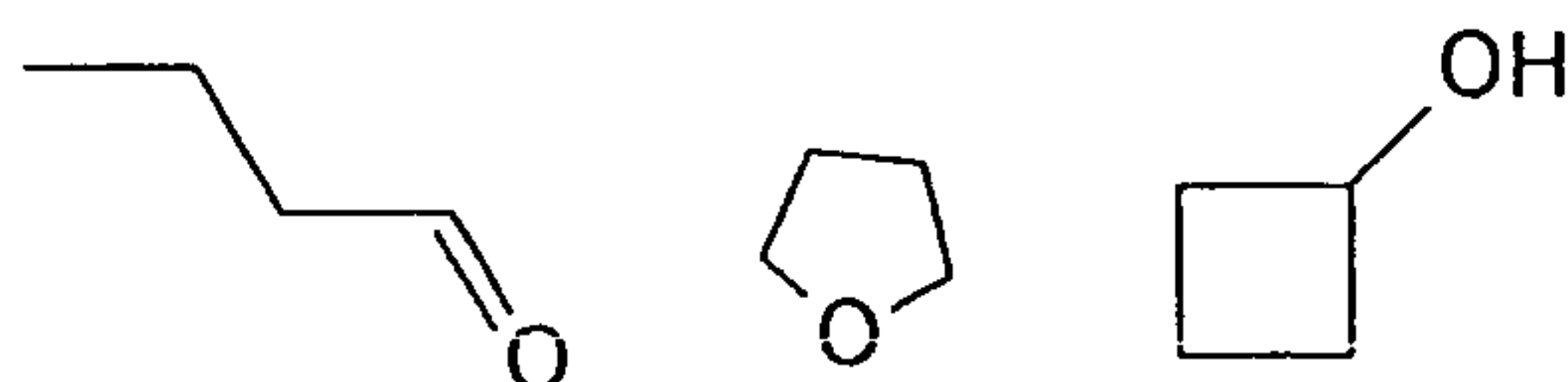
1. Amides are compounds containing the following group of atoms.



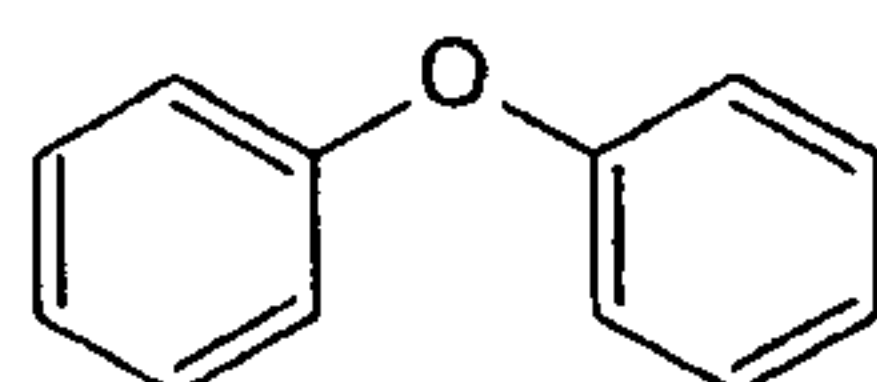
This type of group is important in proteins. The properties of an amide bond are best rationalized on the basis of resonance contribution for the amide. Write three resonance contributors for the amide.

2. Follow the previous question (Question 1). Draw the electric dipole moment associated with the amide.

3. Which of the following compounds has the lowest boiling point?

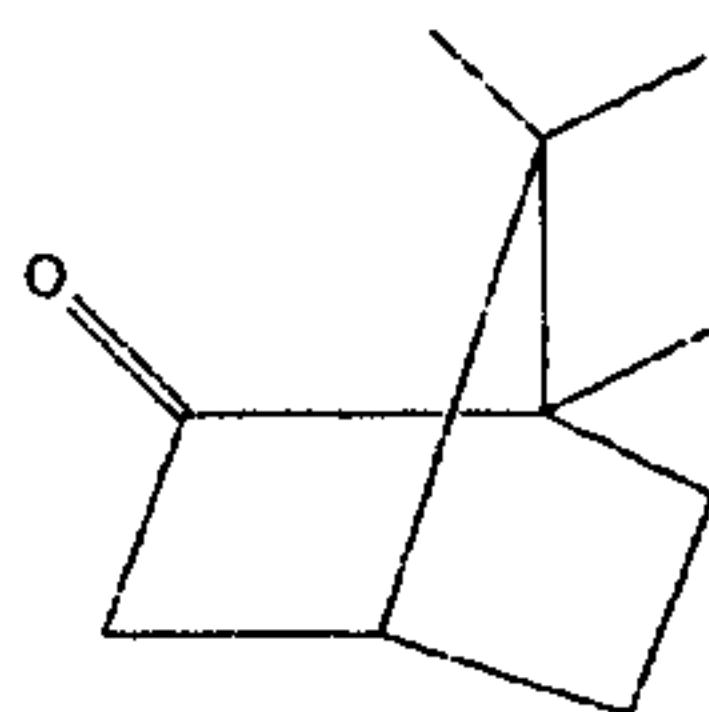


4. Name the compound below.

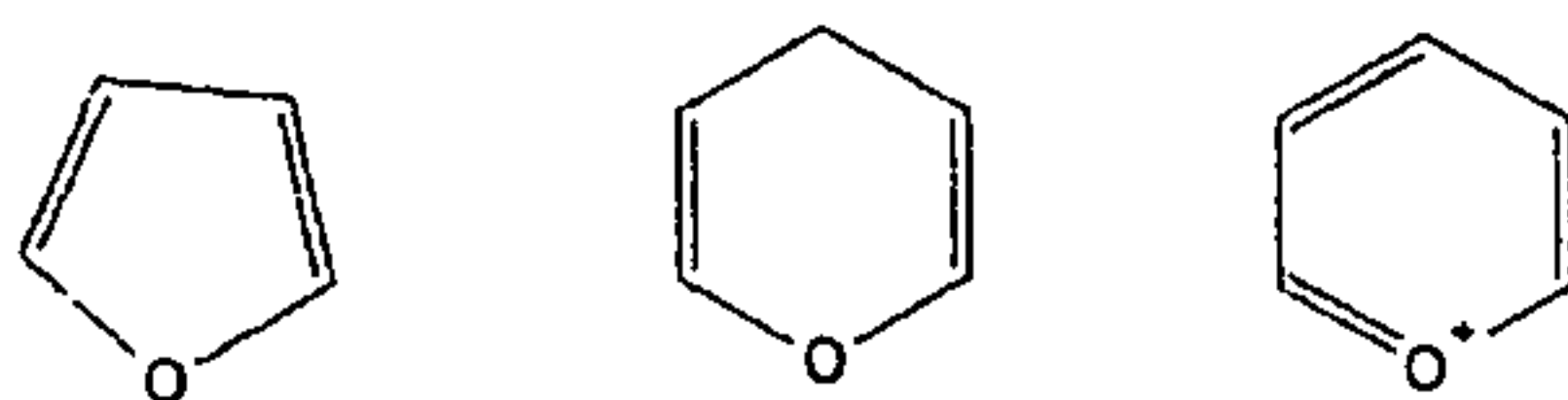


5. Write the structural formula for the N,N-dimethylbenzamide.

6. Find the isoprene units in the following compound.



7. Which of the following compounds is NOT aromatic?



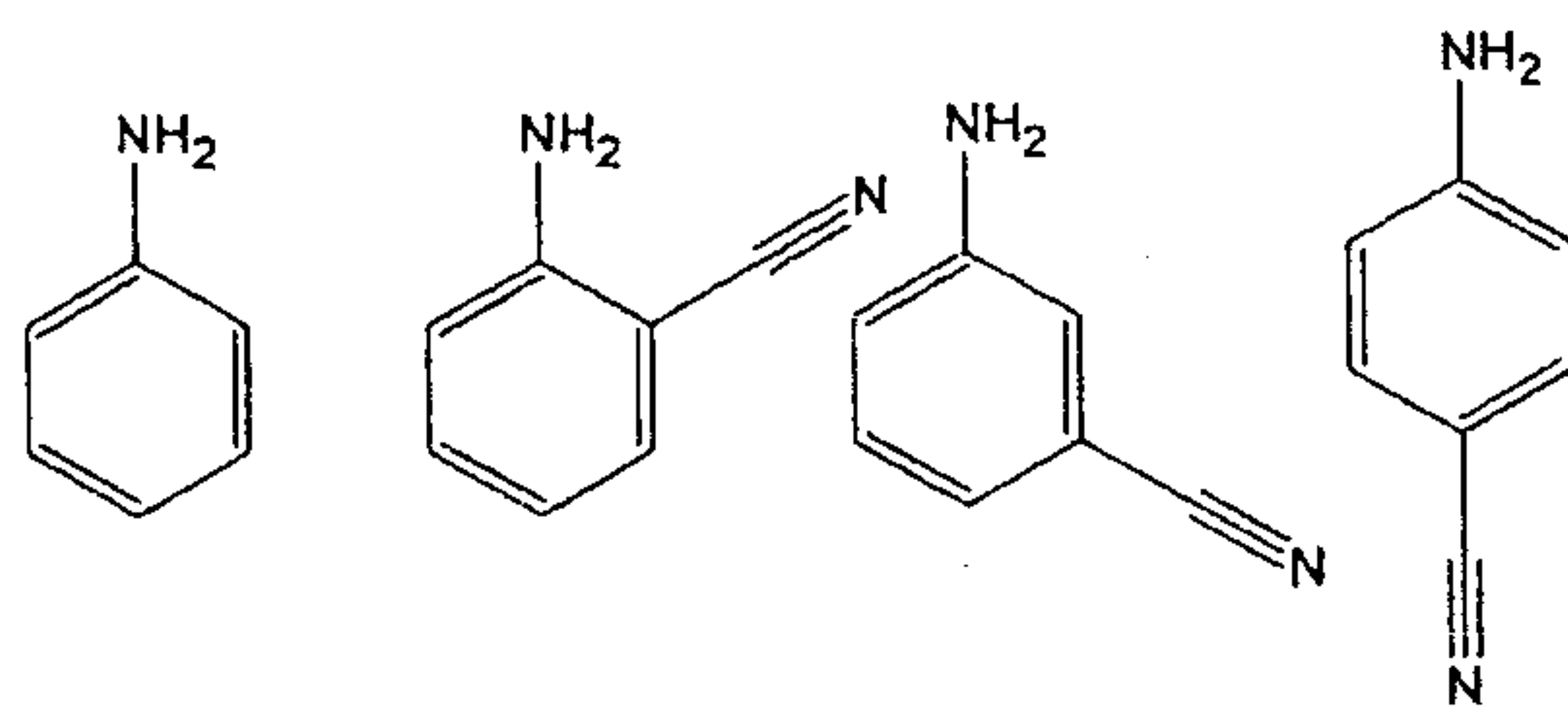
8. Write the structure of the enantiomer of D-(+)-glucose.

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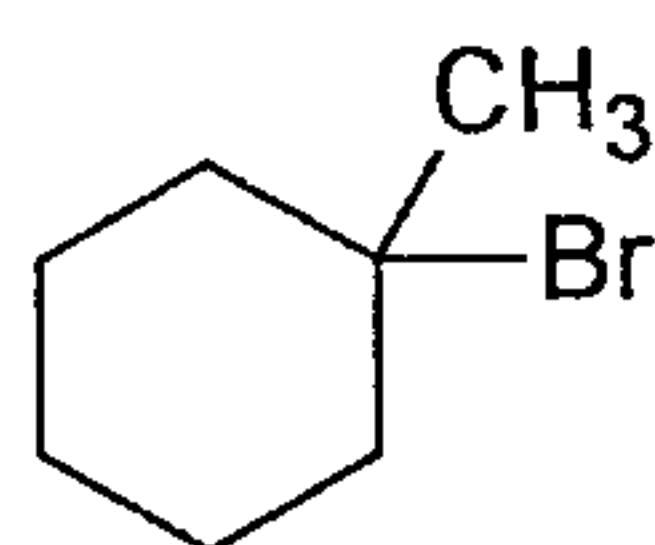
系所班組別：生命科學院乙組、醫學生物科技學程

考試科(代碼)：有機化學(0502、0706) 共 5 頁，第 2 頁 *請在【答案卷】作答

9. Arrange the following compound in the order of pKa value from the highest to the lowest.

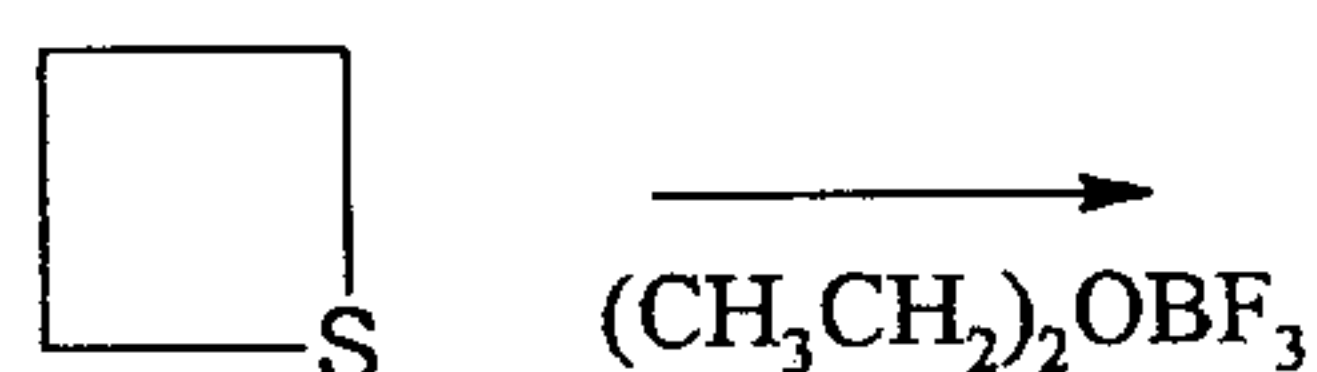


10. Does the following compound contain an asymmetric carbon? If so, indicate the position of the asymmetric center.

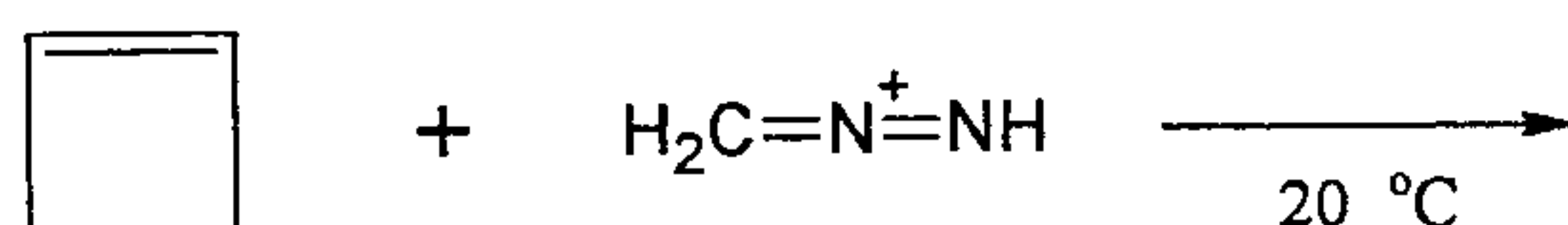


Part II. 完成下列化學反應 (每題 3%。請在答案卷上依序作答)

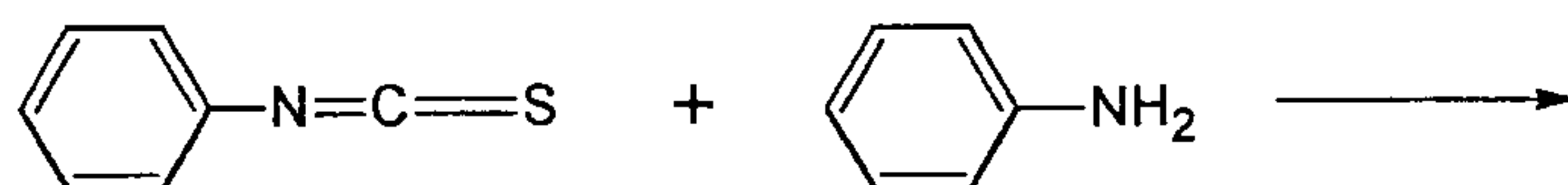
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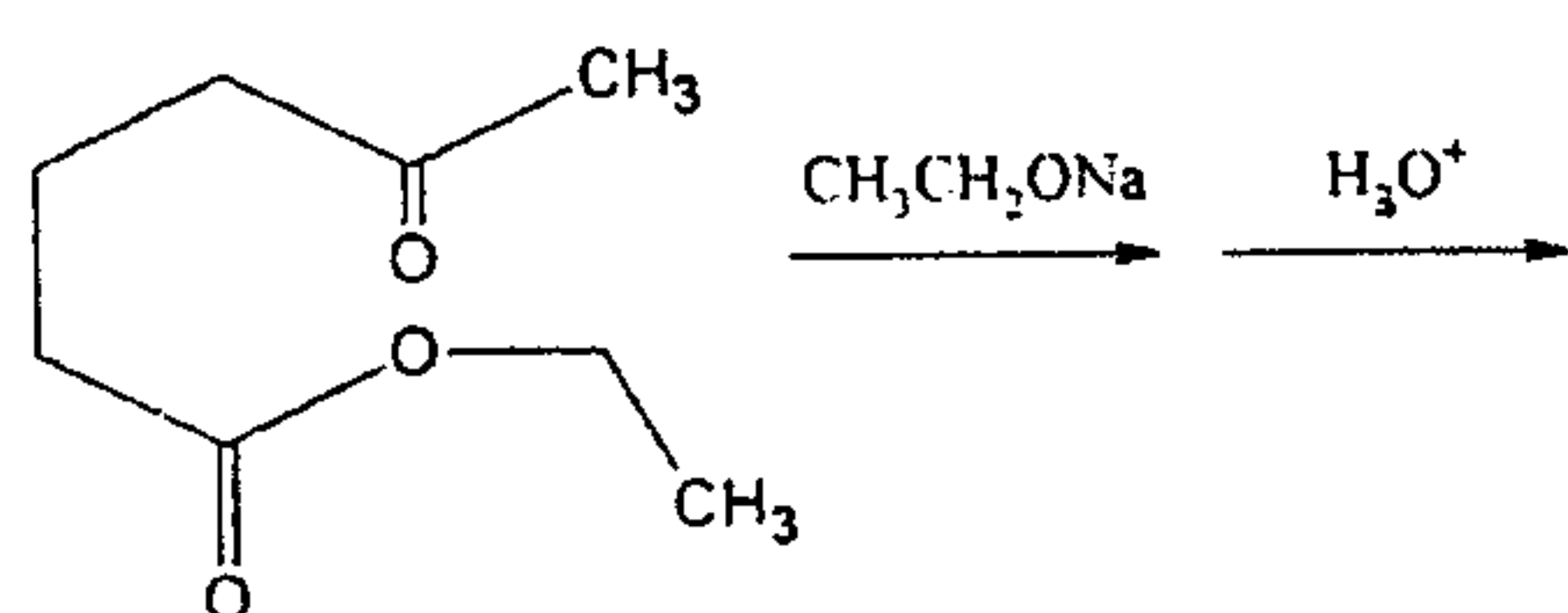
12.



13.



14.

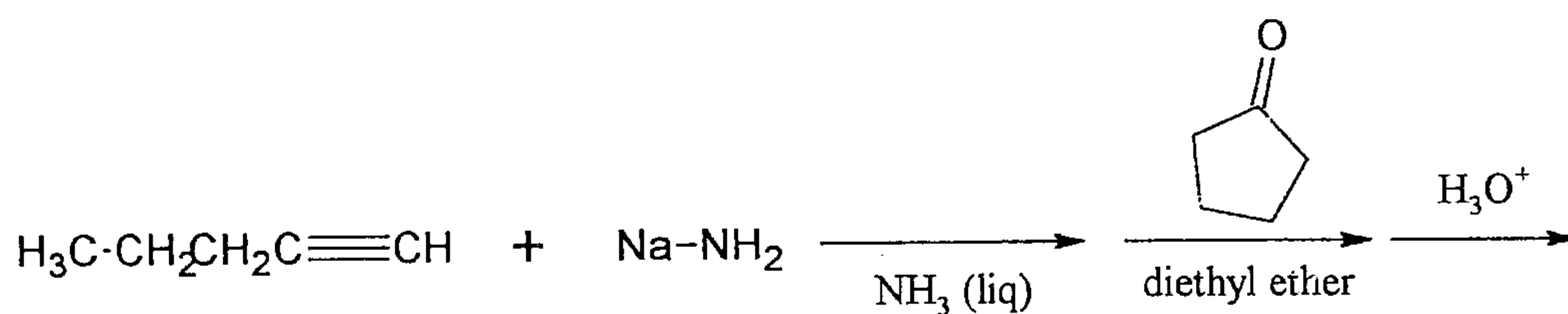


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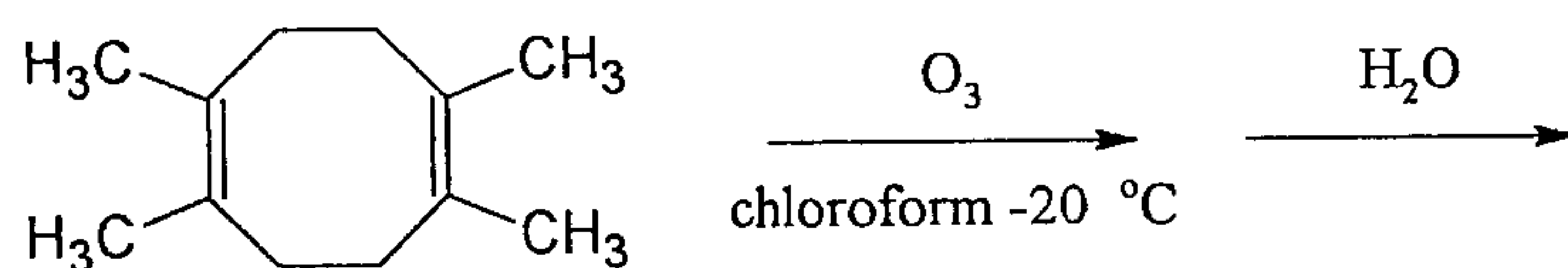
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考試科(代碼)：有機化學(0502、0706) 共 5 頁，第 3 頁 *請在【答案卷】作答

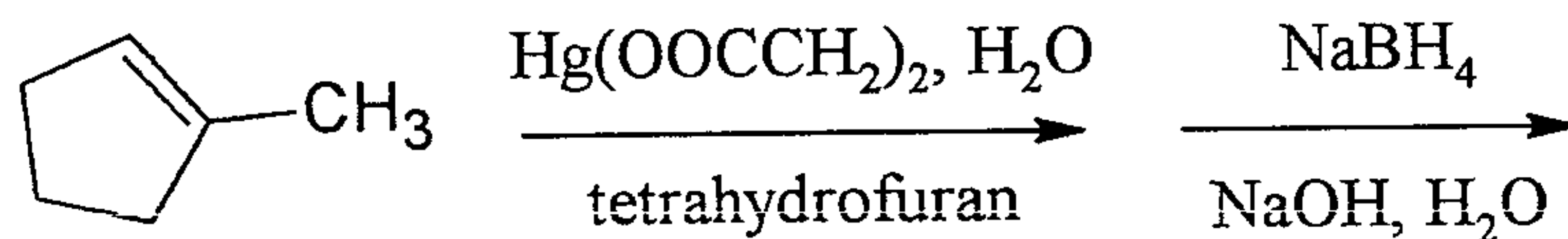
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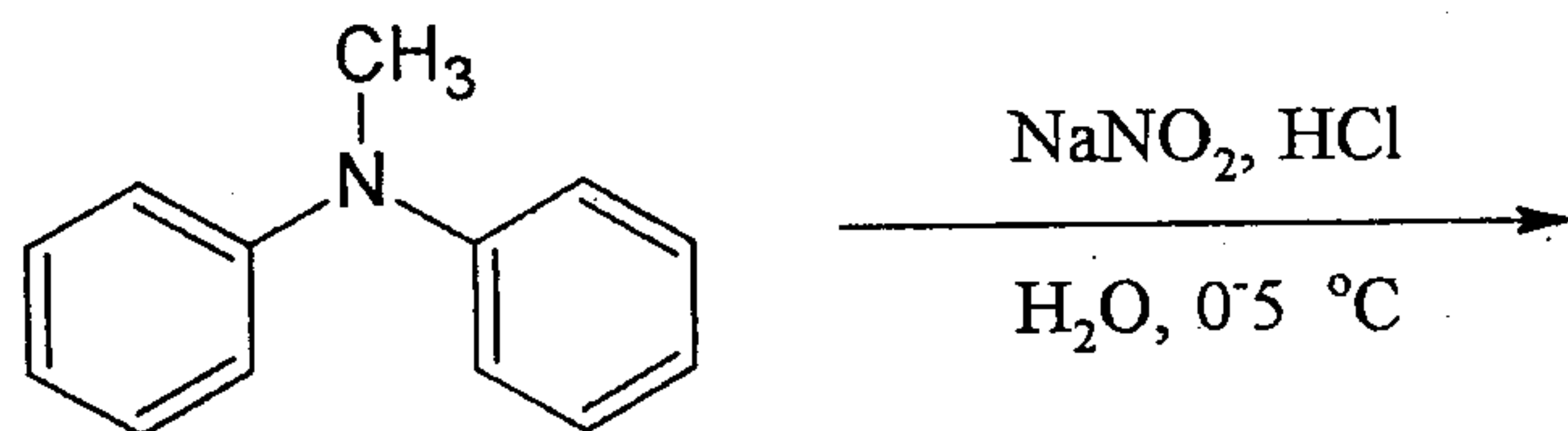
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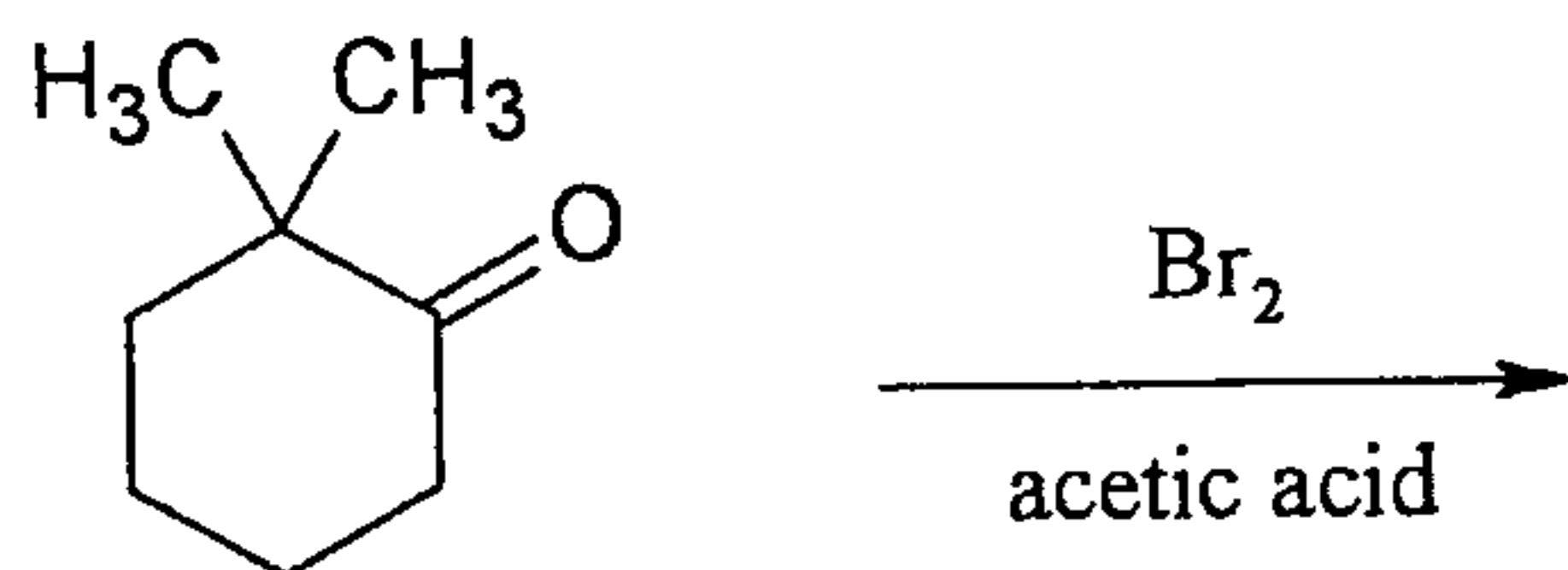
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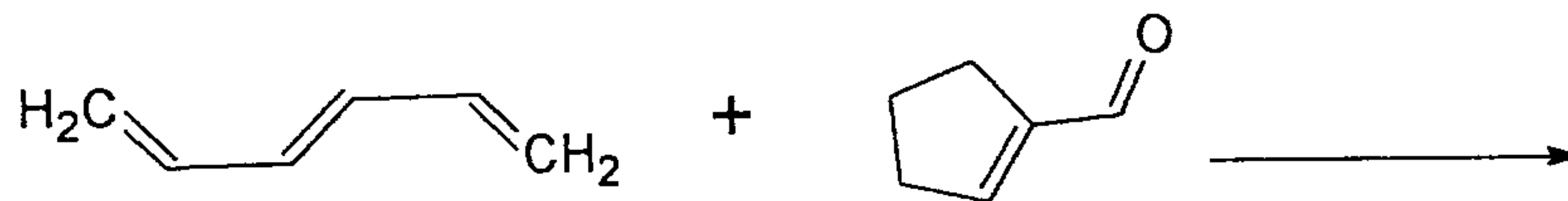
18.



19.



20.



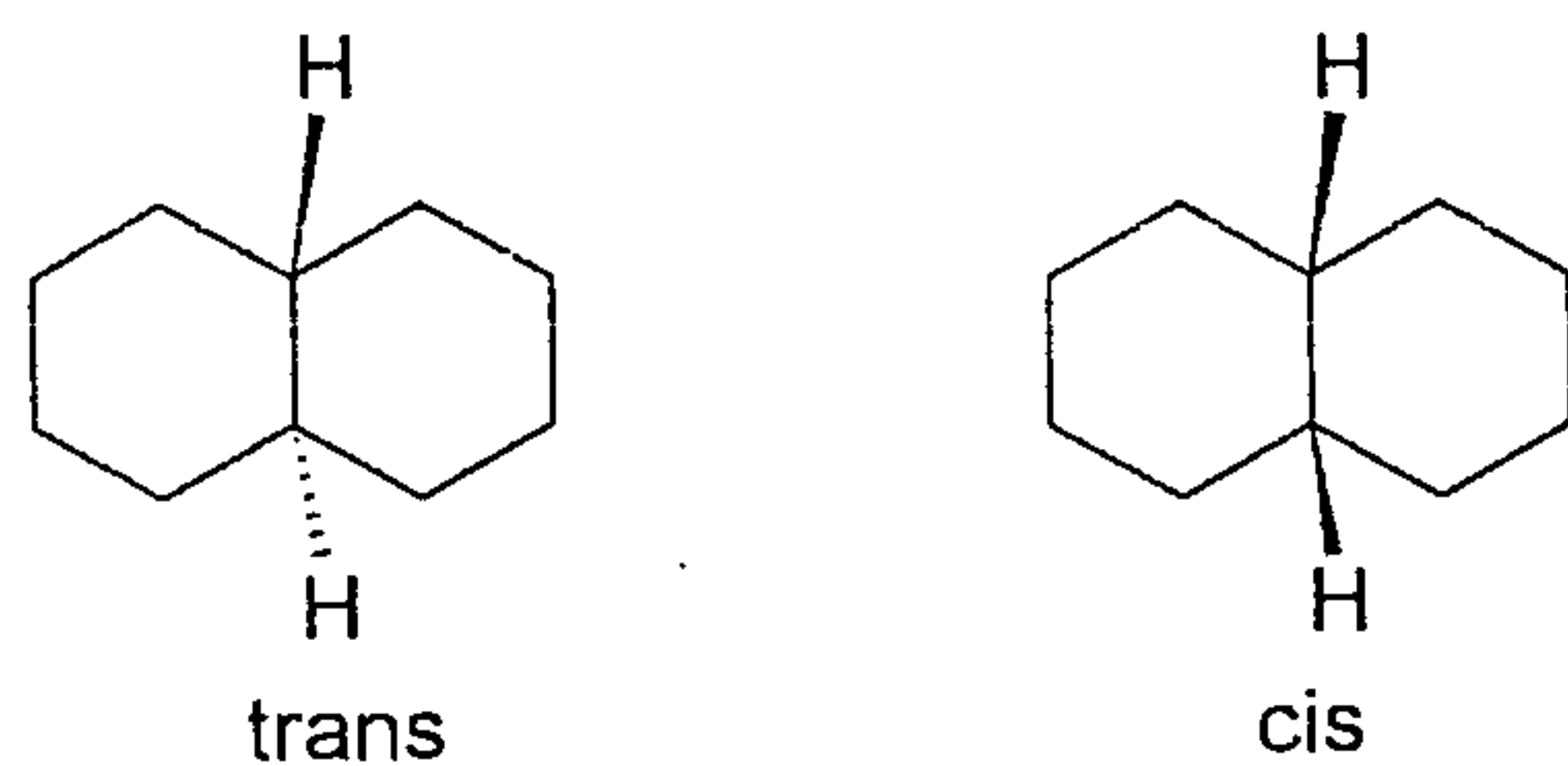
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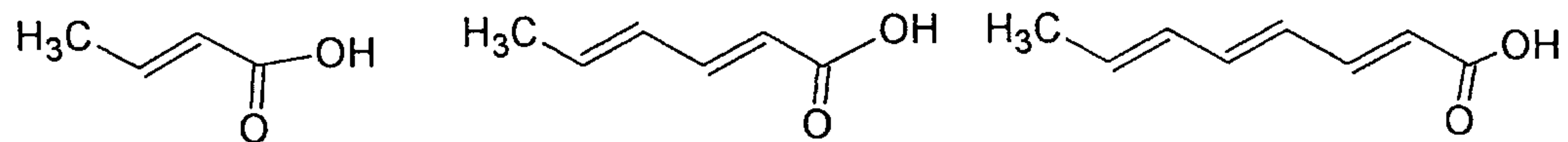
考試科(代碼)：有機化學(0502、0706) 共 5 頁，第 4 頁 *請在【答案卷】作答

Part III. 問答題 (請在答案卷上作答)

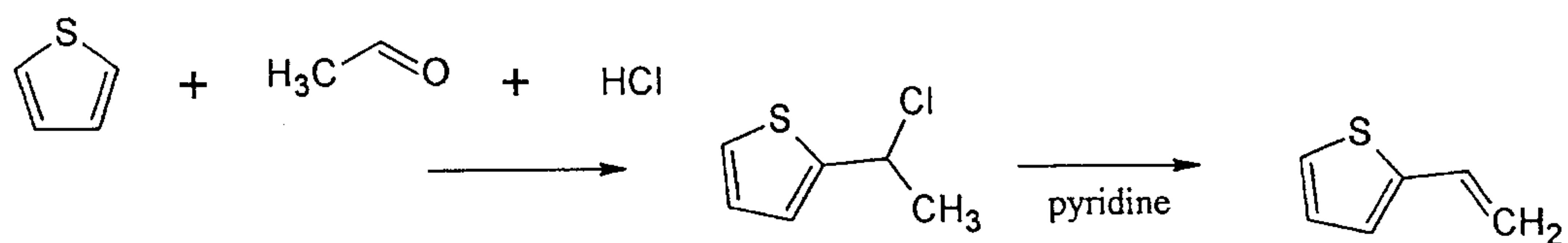
21. (5%) The compound decalin has two cyclohexane rings fused together. The hydrogen atoms at the ring junction are on the same side of the ring in *cis*-decalin and opposite sides of the ring in *trans*-decalin, as show below in the planar formulas. Which stereoisomer of decalin is more stable? Why?



22. (5%) Three samples, labeled Compound A, B, and C, are known to be unsaturated carboxylic acids. Ultraviolet spectra were taken of the three samples with the following results: Compound A, B, and C has a maximum absorption at 302, 208, and 261 nm, respectively. Identify each structural formula given below as belonging to Compound A, B, or C? And what is your explanation for it?



23. (10%) The following reactions are observed. Write detailed mechanisms showing how the transformations could have taken place.

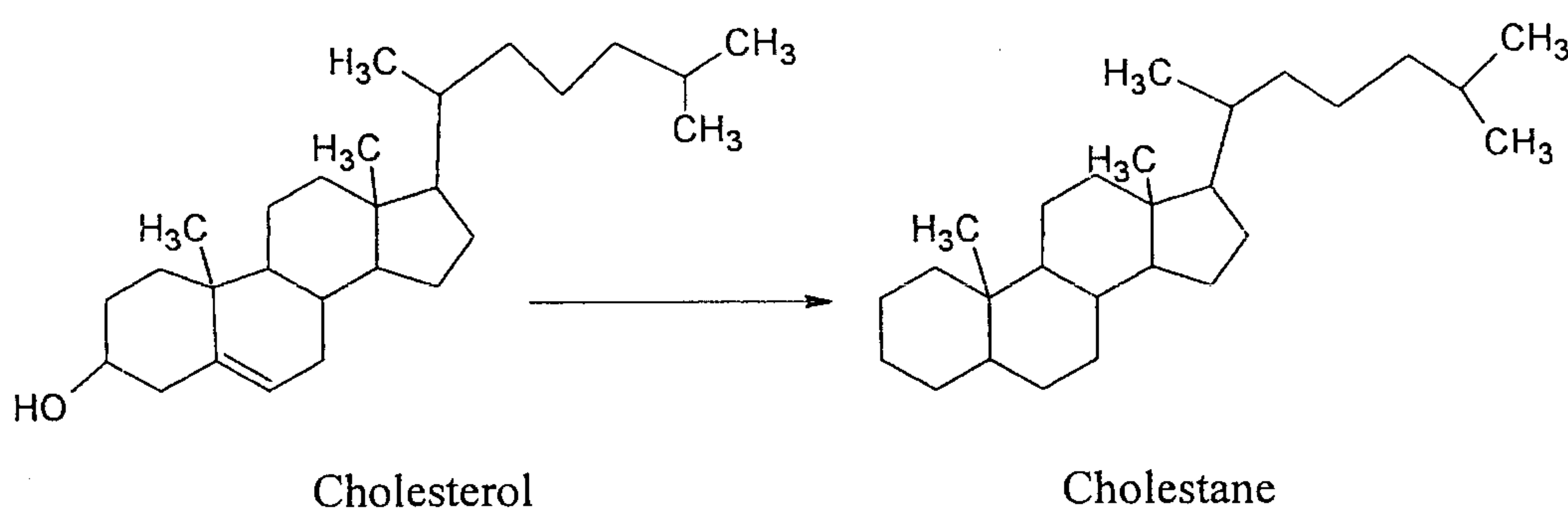


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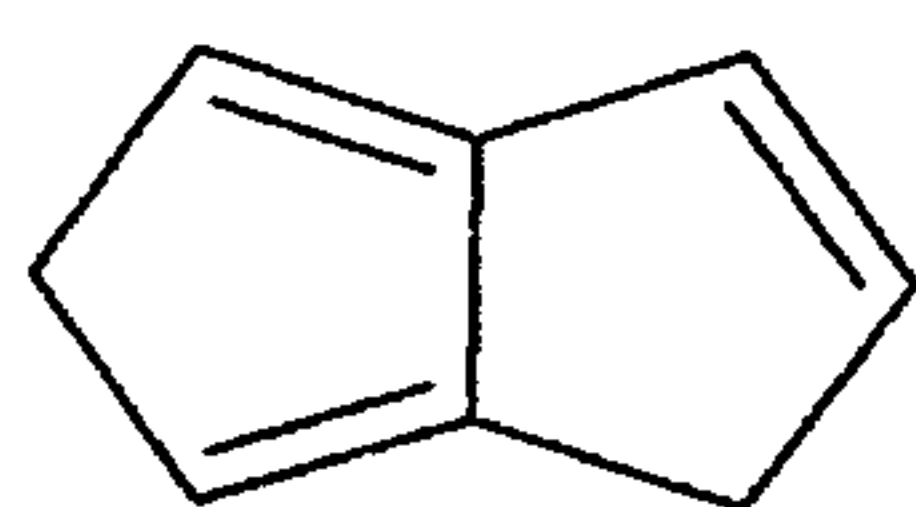
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考試科(代碼)：有機化學(0502、0706) 共 5 頁，第 5 頁 *請在【答案卷】作答

24. (10%) Cholesterol is converted into cholestane in several steps. Supply the _____ reagents necessary to make this synthetic transformation.



25. (10%) When dihydropentalene is treated with a little more than two moles of *n*-butyllithium, a stable white crystalline material KK is obtained. In contrast to the rather complicated NMR spectrum of dihydropentalene, the NMR spectrum of KK is simple, with only two signals, *a* and *b*.



dihydropentalene

a doublet, δ 4.98, $J = 3$ Hz.

b triplet, δ 5.73, $J = 3$ Hz.

Peak area ratio $a : b = 2 : 1$

What is the structure for KK? Explain the stability of the compound KK (Is it a stable compound? Why?).