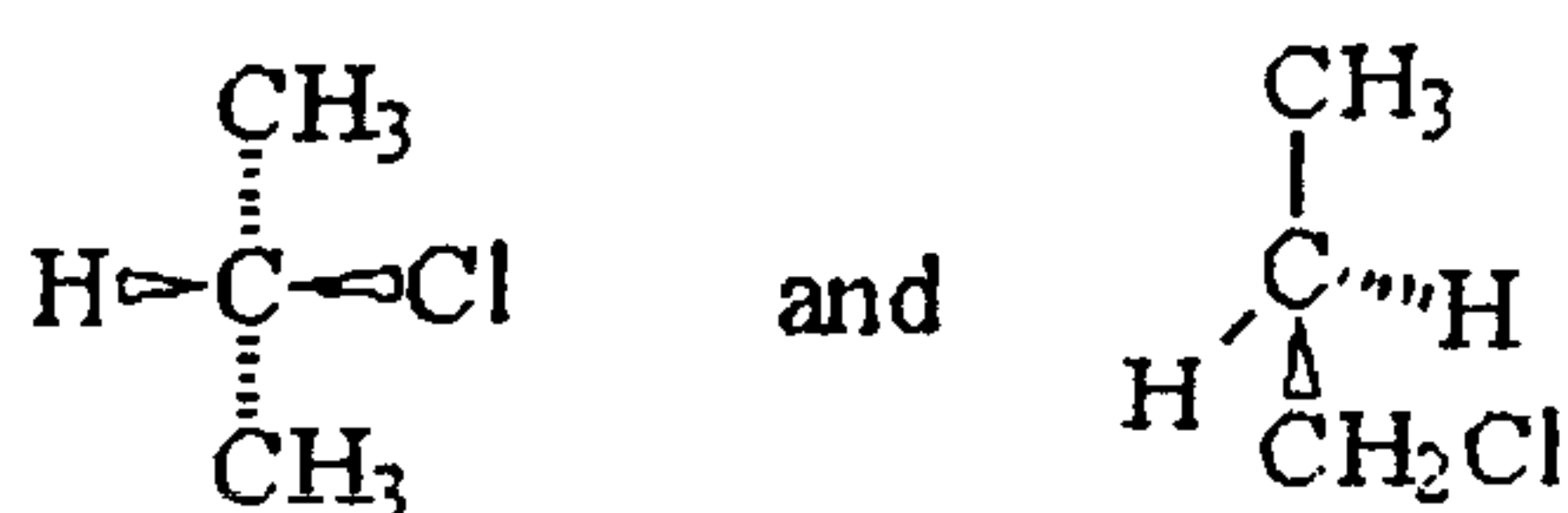


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 生醫工程與環境科學系(0525)
 甲組(分子生醫光電組)

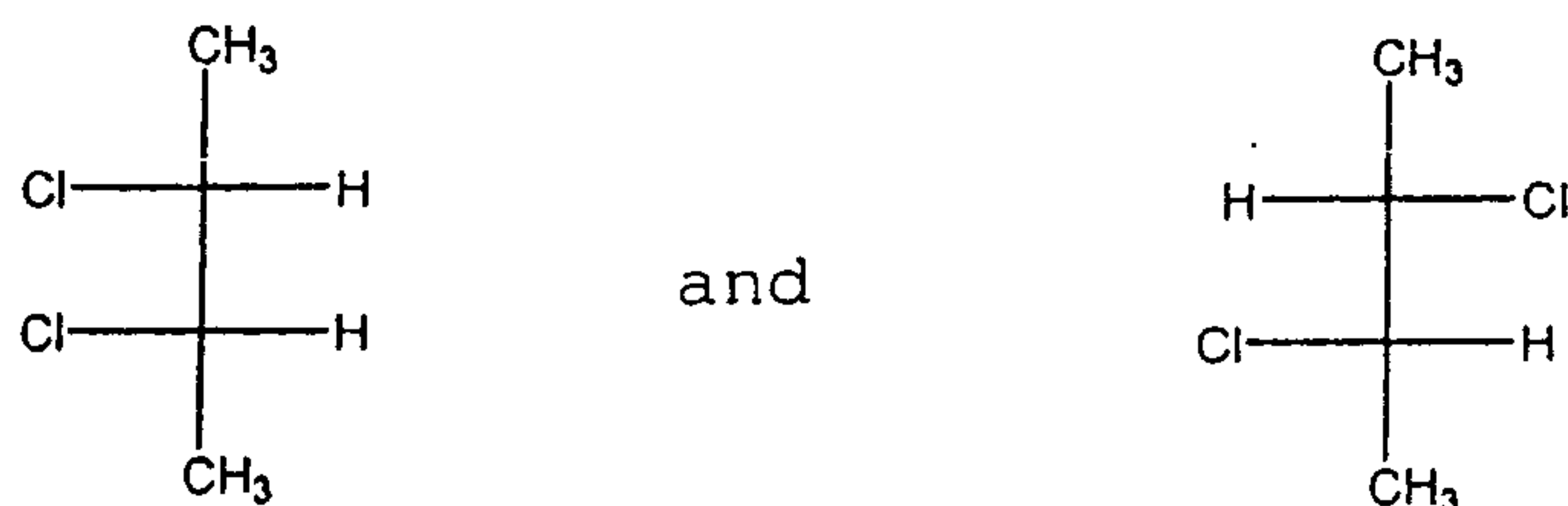
科目有機化學 科目代碼 2504
 總分 100 分；共 29 題；考試時間 100 分鐘
 共 11 頁，第 1 頁
 第一部分 選擇題(No. 1-9) 請在答案卷作答
 單選 每題 2 分 共 18 分

1) What is the relationship between the following compounds?



- A) constitutional isomers
- B) diastereomers
- C) conformational isomers
- D) superimposable without bond rotation
- E) enantiomers

2) What is the relationship between the following compounds?



- A) constitutional isomers
- B) diastereomers
- C) conformational isomers
- D) enantiomers
- E) identical compounds

3) What is the relationship between the following compounds?



- A) diastereomers
- B) enantiomers
- C) constitutional isomers
- D) superimposable without bond rotation
- E) conformational isomers

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4) Using a 60 MHz spectrometer, the protons in dichloromethane appear at 5.30 ppm. When the same sample is placed in a 100 MHz instrument, where does the signal appear?

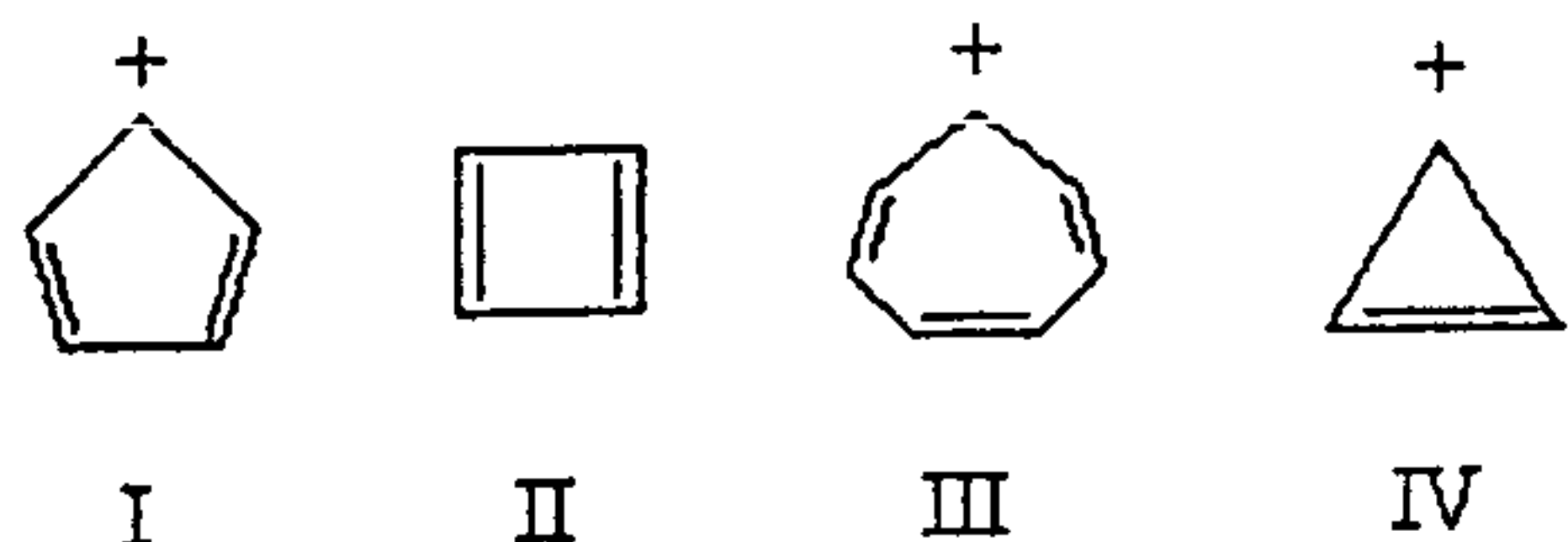
- A) 8.33 ppm
- B) 5.30 ppm
- C) 3.18 ppm
- D) cannot be determined from information given

5) How many distinct triplets would you expect in the ^1H NMR of the compound below?



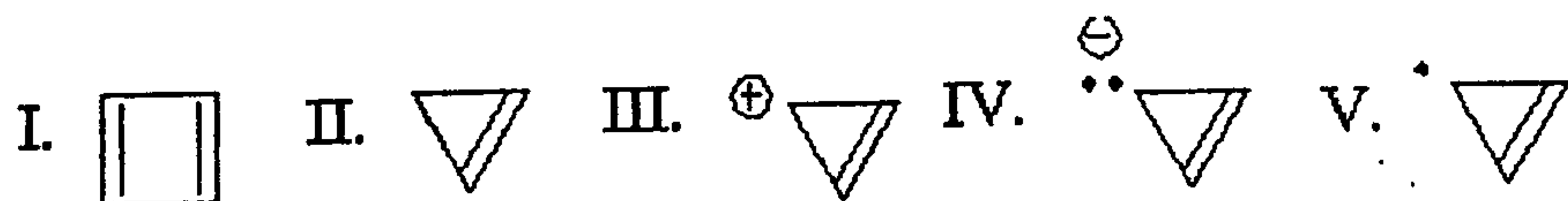
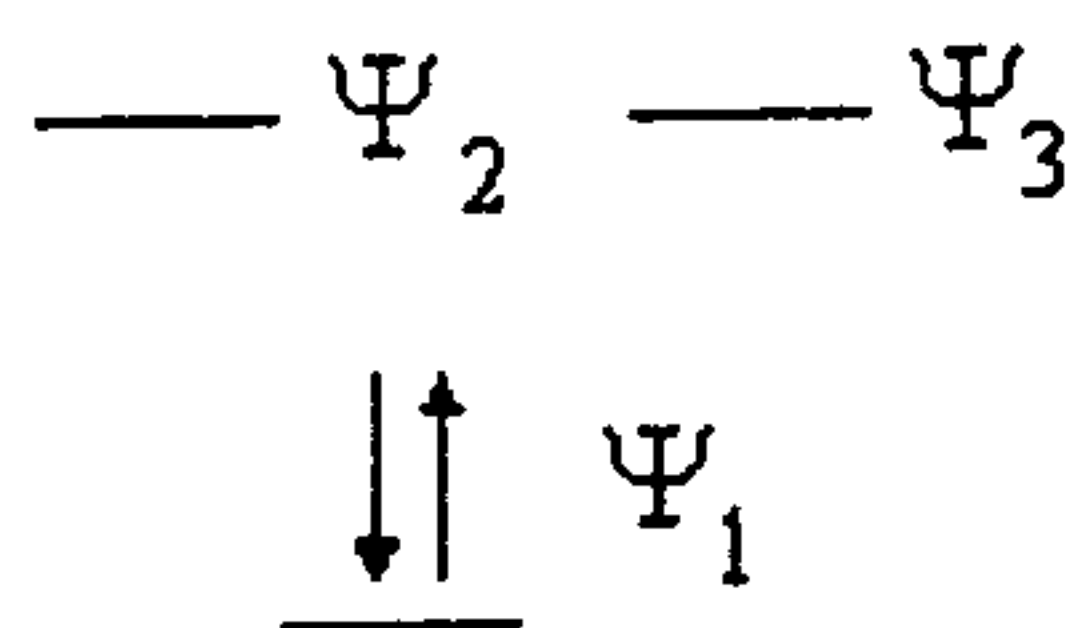
- A) 8
- B) 2
- C) 6
- D) 0
- E) 4

6) Which of the structures below would be aromatic?



- A) I, III, and IV
- B) I and IV
- C) II
- D) III and IV

7) Which species is represented by the following distribution of π electrons in the molecular energy diagram?

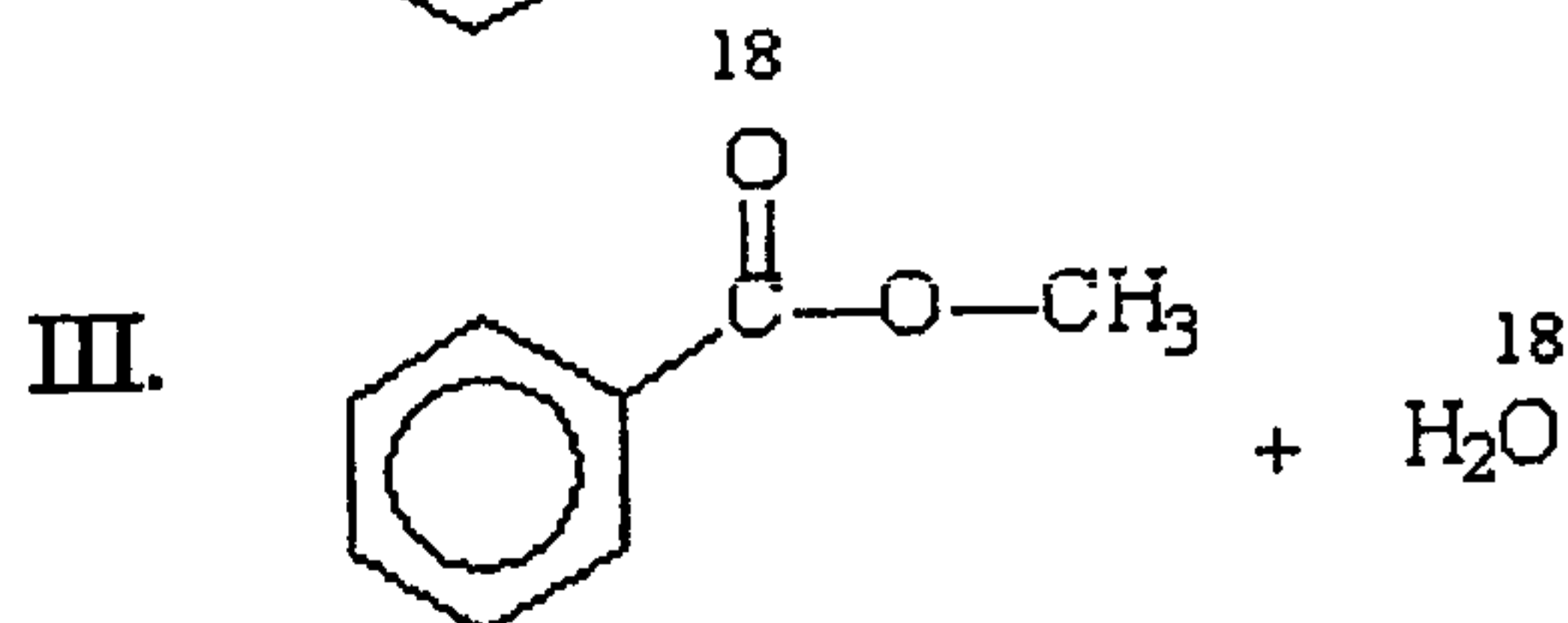
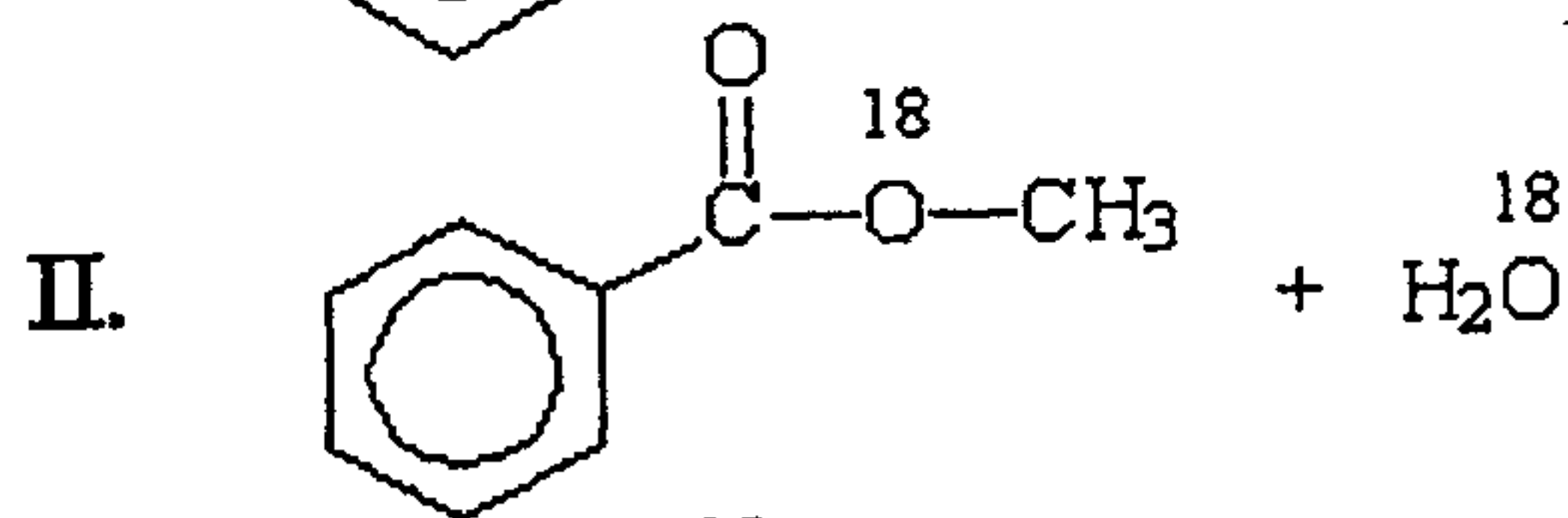
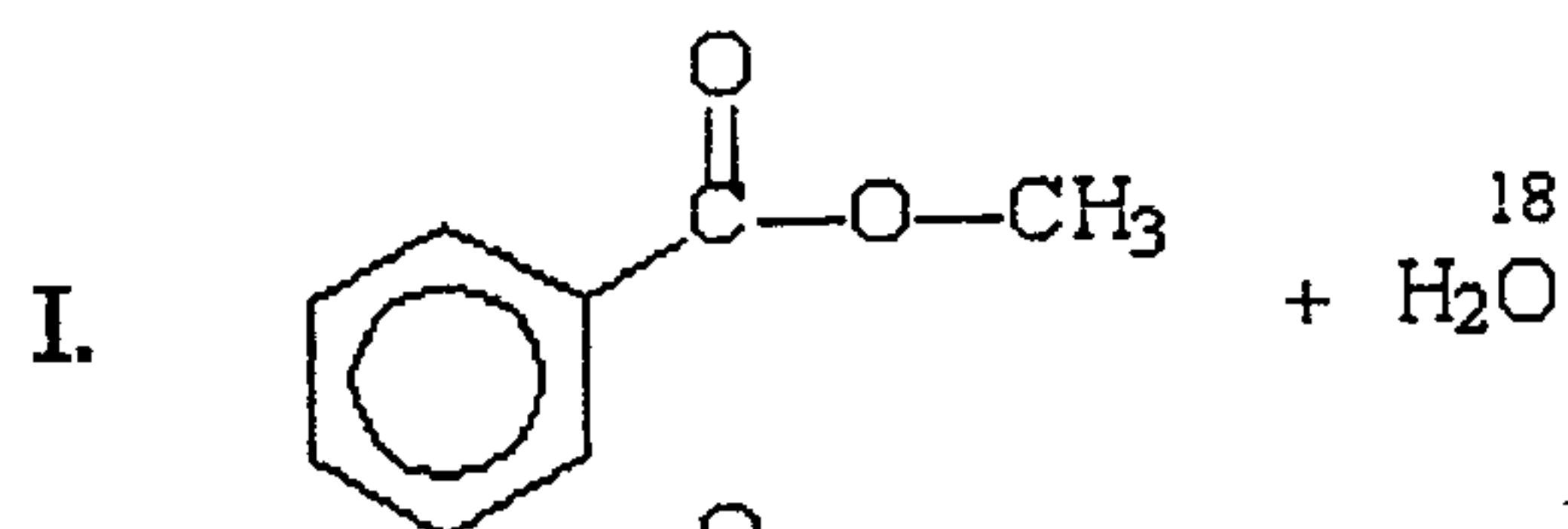
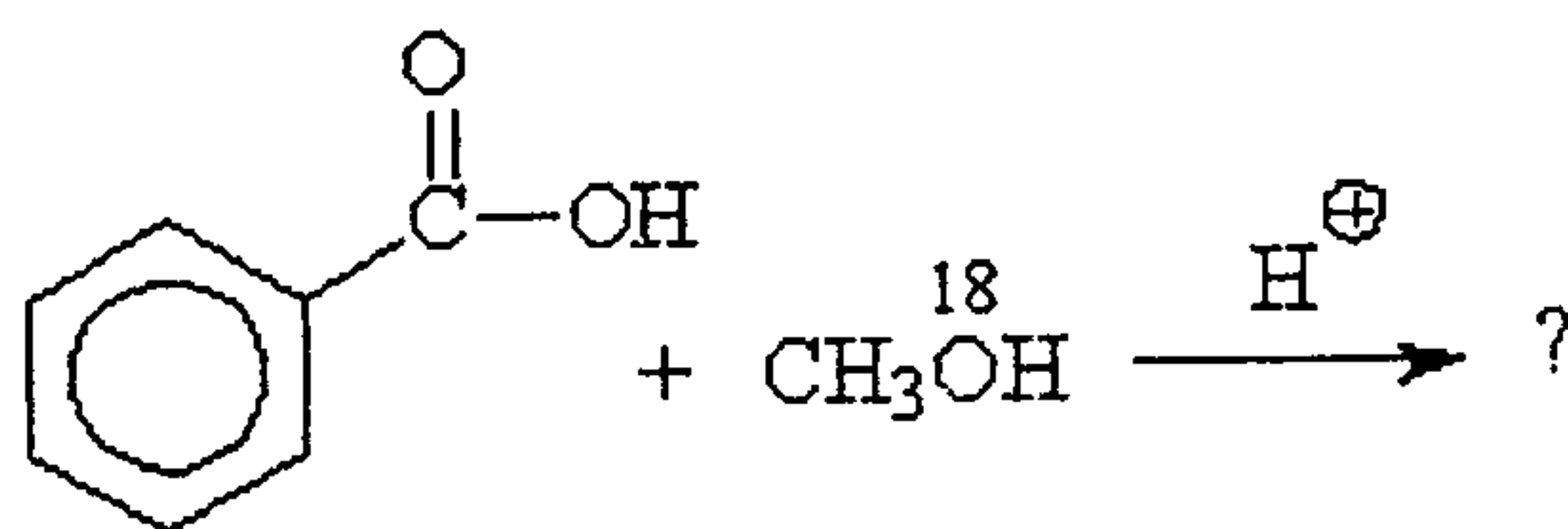


- A) I
- B) II
- C) III
- D) IV
- E) V

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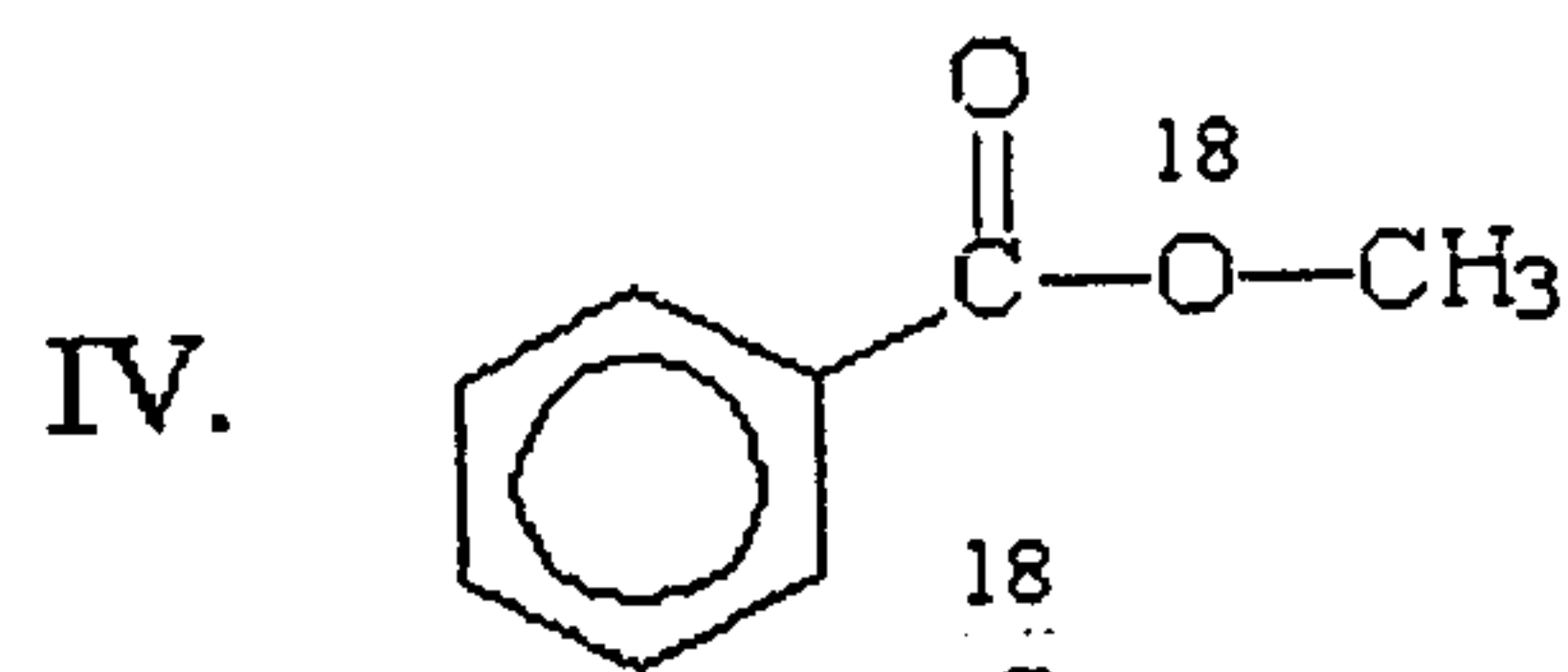
8) What is the product obtained from the following reaction?



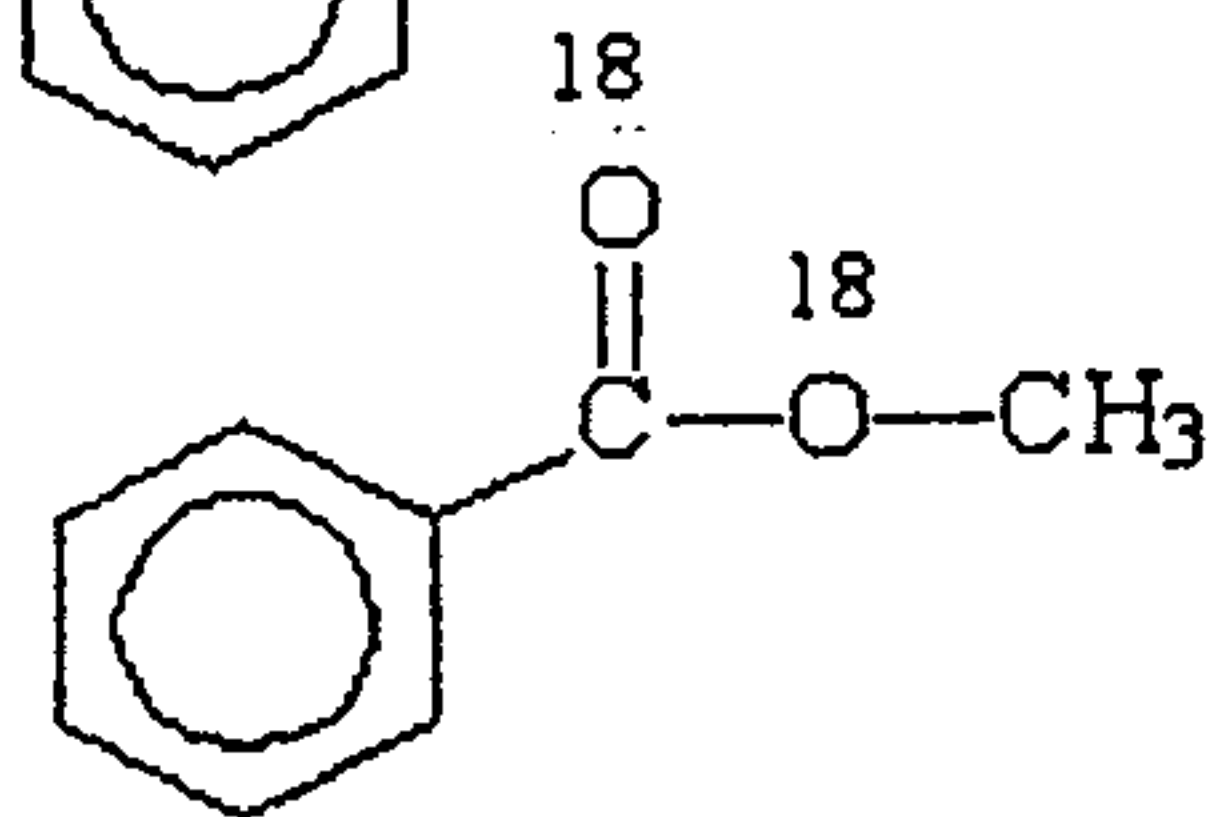
A) I

B) II

C) III



V.



D) IV

E) V

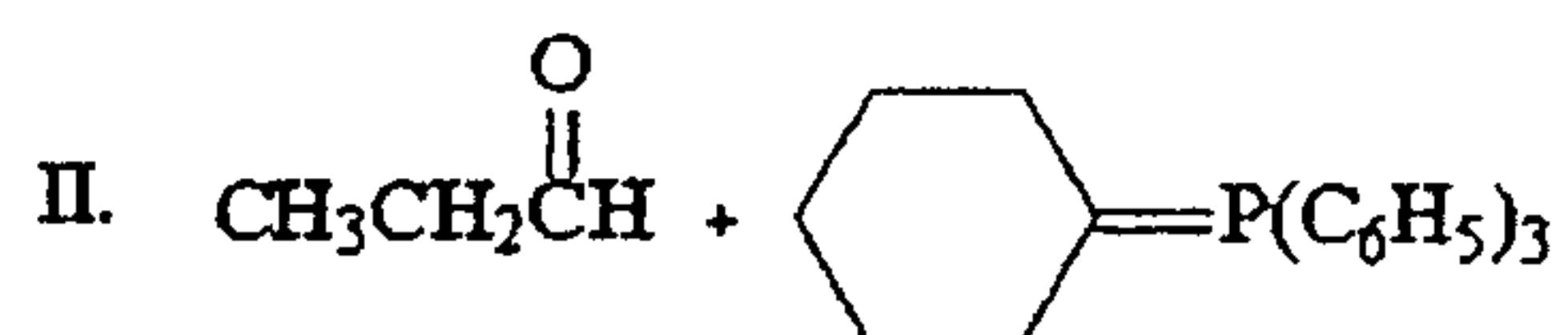
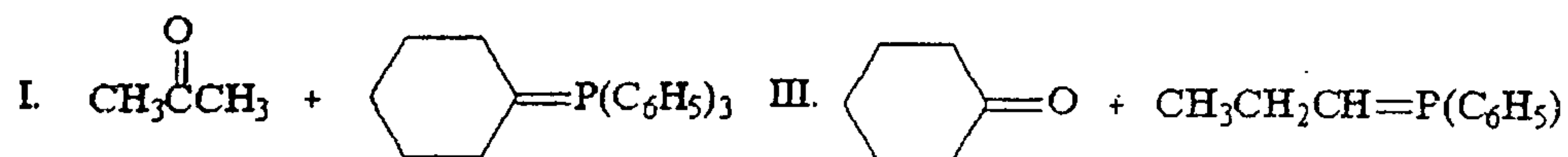
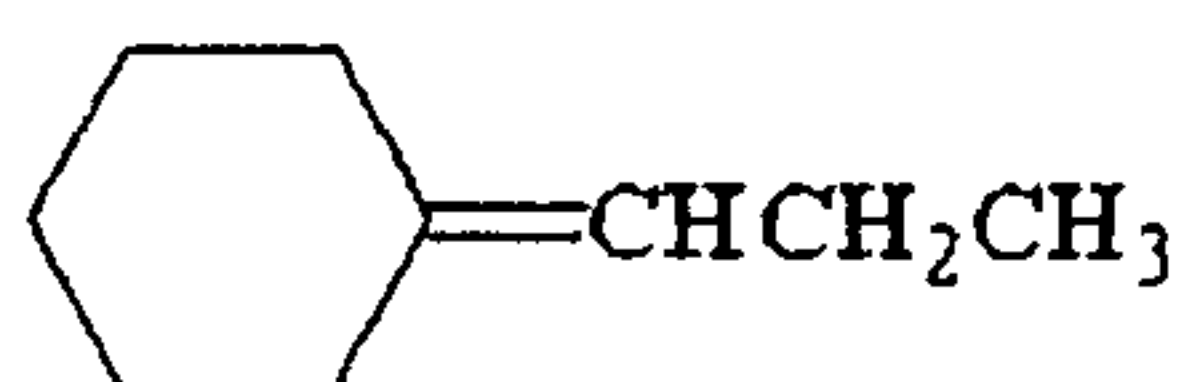
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共 11 頁，第 4 頁

9) What carbonyl compound and what phosphonium ylide are required for the synthesis of the following alkene?



- A) I
- B) II
- C) III
- D) II or III
- E) I, II, or III

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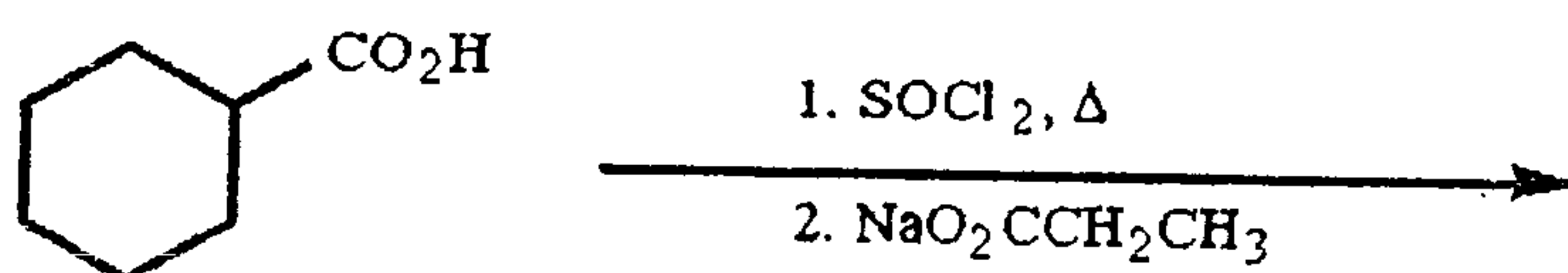
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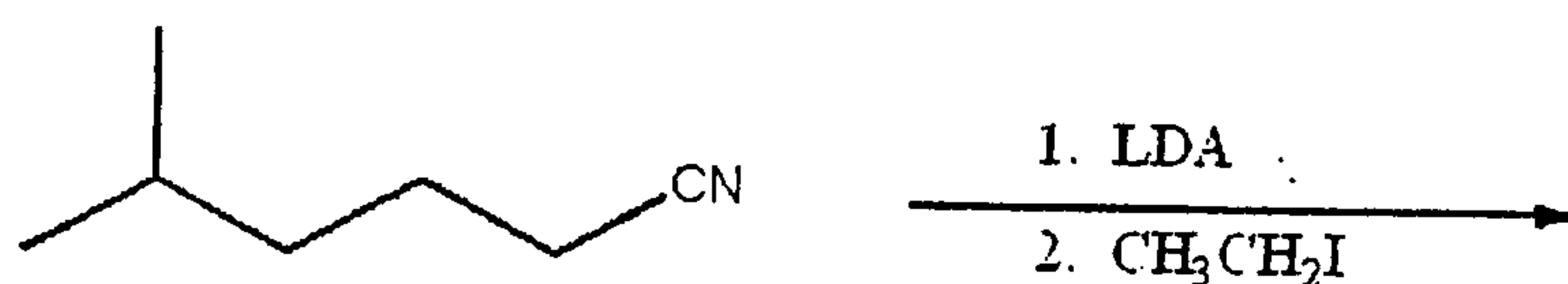
第二部分 簡答題(No. 10-19) 請在答案卷作答

共 32 分

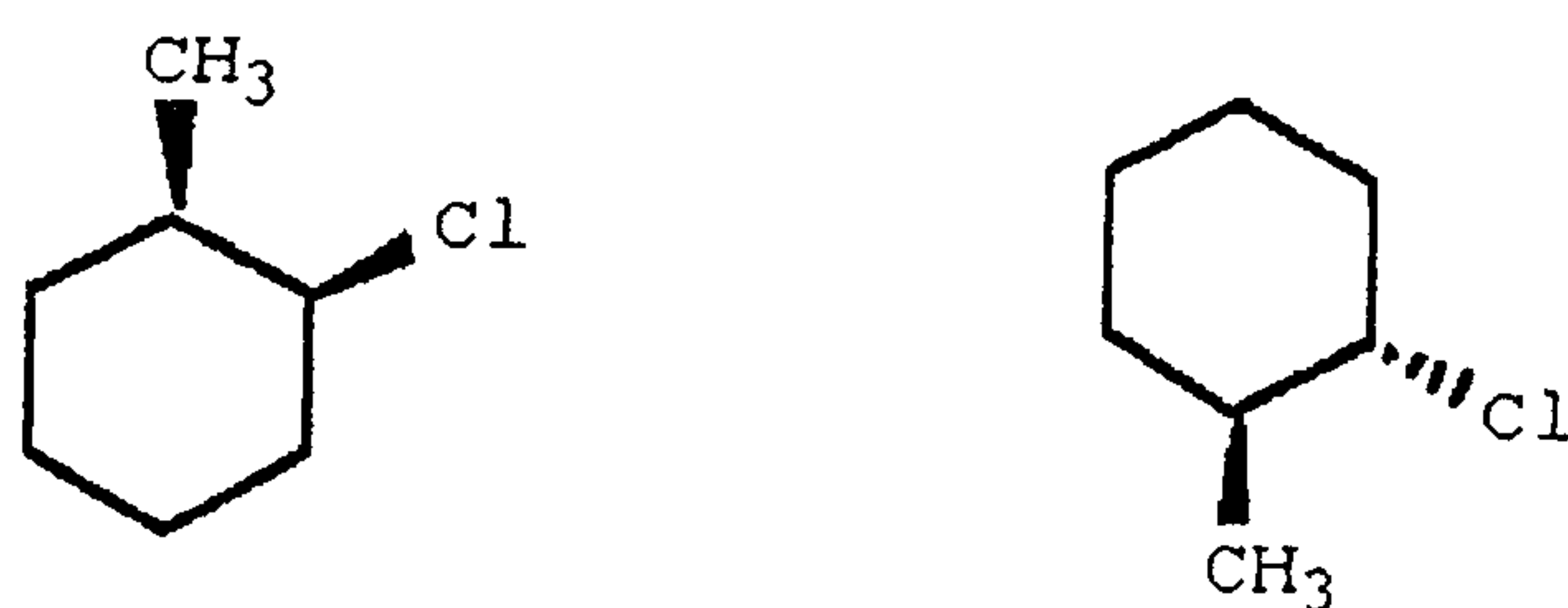
- 10) Provide the structure of the major organic product of the following reaction sequence. 2pts



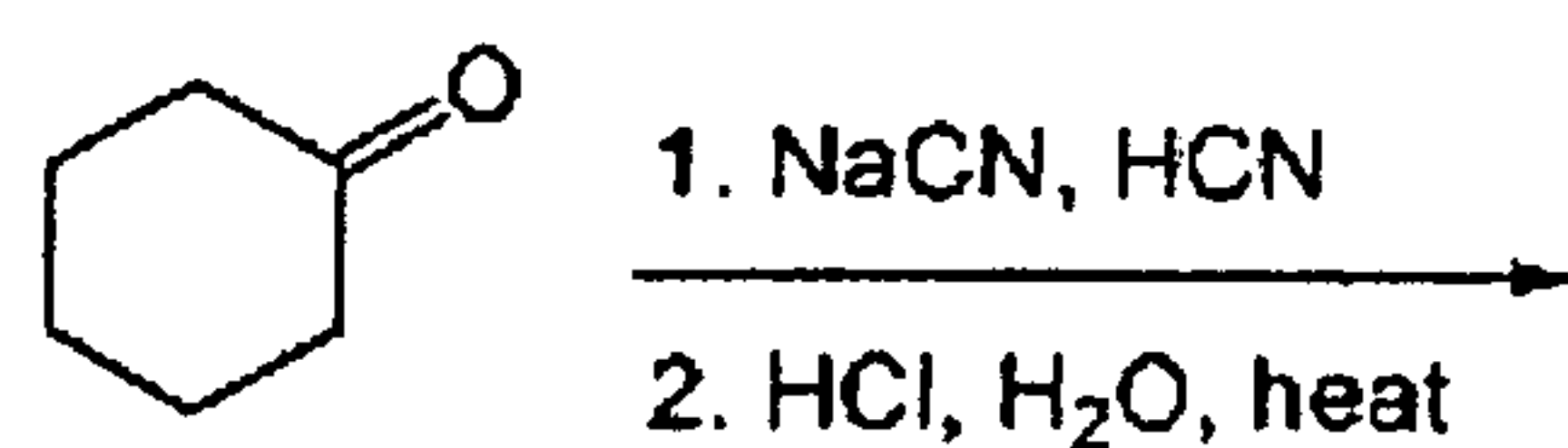
- 11) Provide the major organic product of the following. 2pts



- 12) Which of the following terms best describes the pair of compounds shown: enantiomers, diastereomers, or the same compound? 2pts



- 13) Provide the major organic product(s) of the reaction below. 2pts

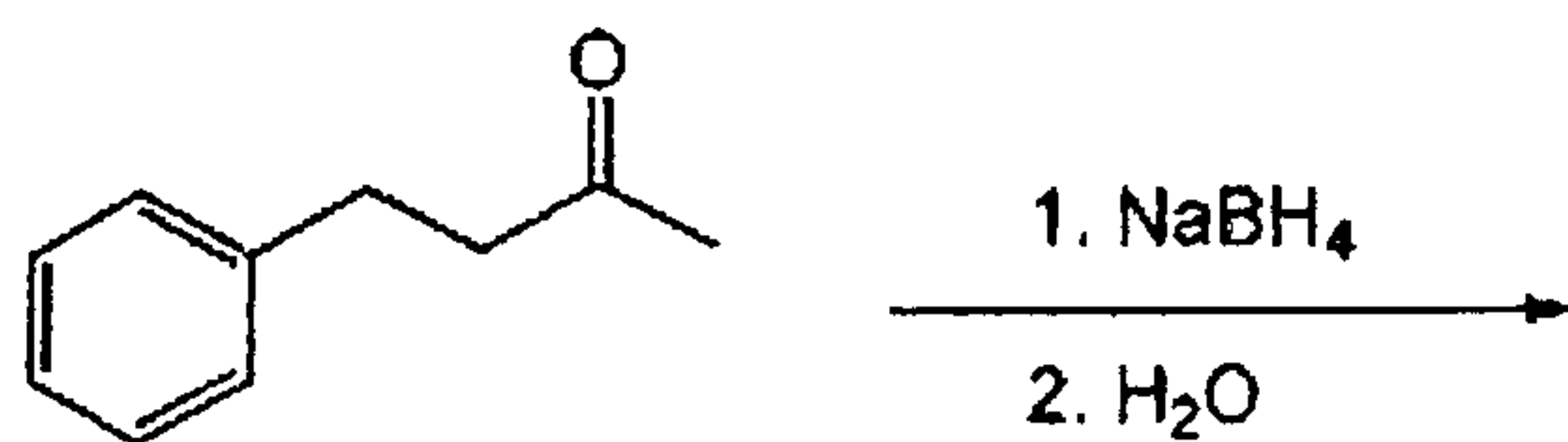


- 14) Provide a detailed, stepwise mechanism for the reaction of butyrolactone with ammonia. 2pts

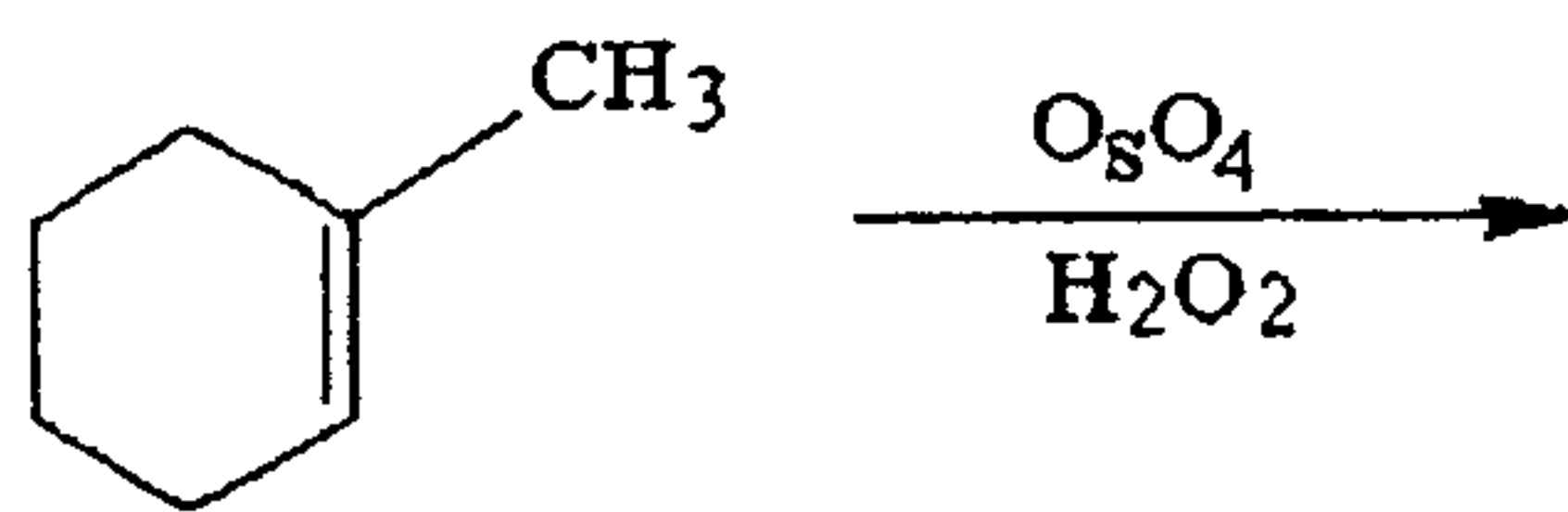
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共 11 頁，第 6 頁

15) Provide the major organic product(s) of the reaction below. 2pts

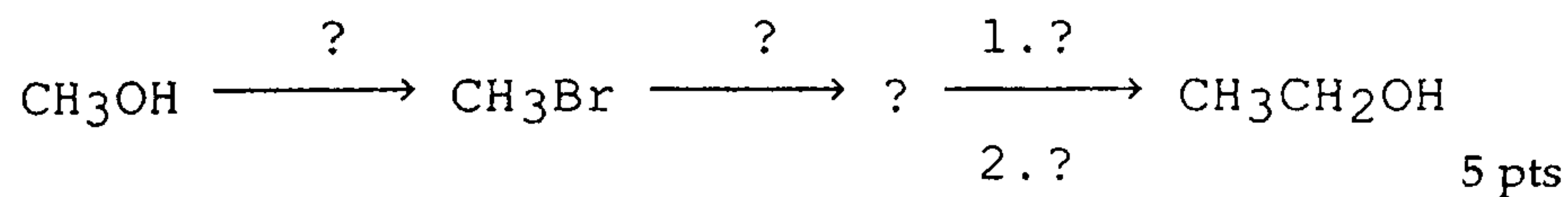


16) Draw the major organic product generated in the reaction below. Pay particular attention to regio- and stereochemical detail. 3 pts



17) Provide a detailed, stepwise mechanism for the acid-catalyzed condensation reaction between cyclohexanone and H₂NOH. 6 pts

18) Complete the following reaction sequence by supplying the missing information:



19) Give one example for each of the following reactions: (a) Gilman reaction, (b) Heck reaction, (c) Suzuki reaction. 6 pts

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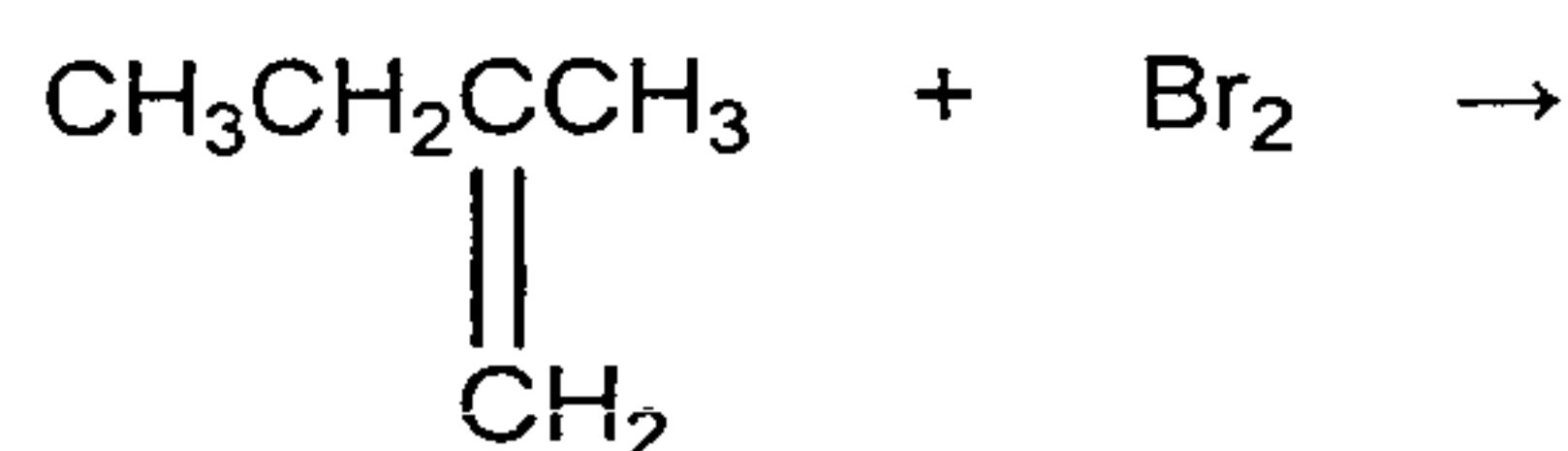
第三部分 問答題(No. 20-29) 請在答案卷作答

共 50 分

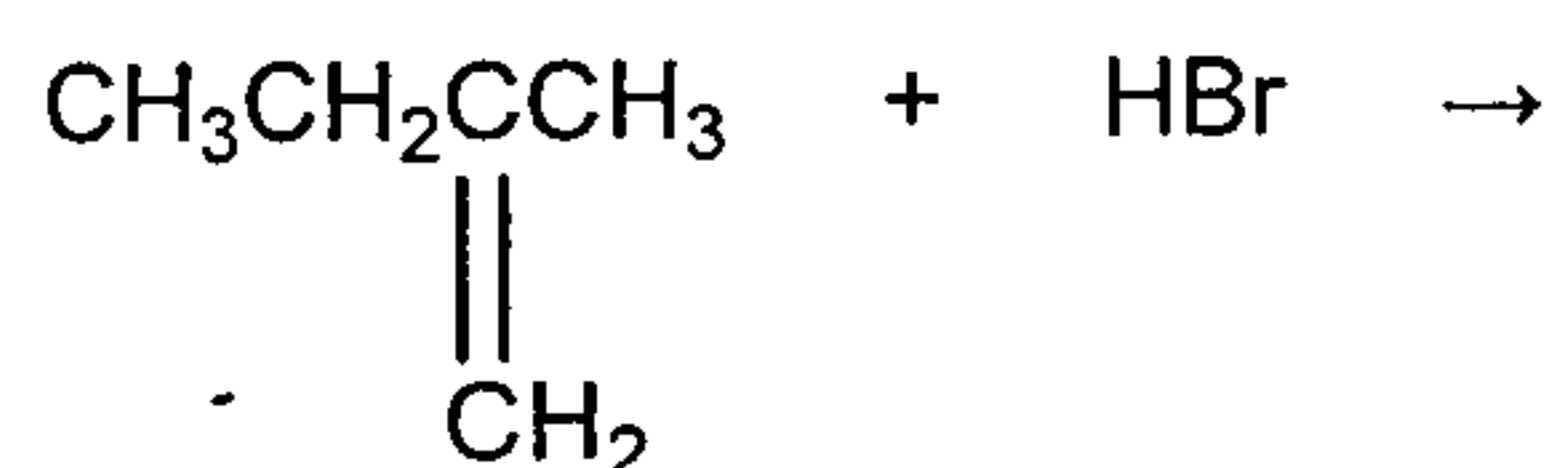
- 20) Draw a reaction free-energy diagram for a reaction $A \rightleftharpoons B \rightleftharpoons C$ that meets the following criteria:
The standard free energies are in the order $C < A < B$, and the rate-limiting step of the reaction is $B \rightleftharpoons C$. 5pts

- 21) Give the structures of both the reactive intermediate and the product in each of the following reactions: 6pts

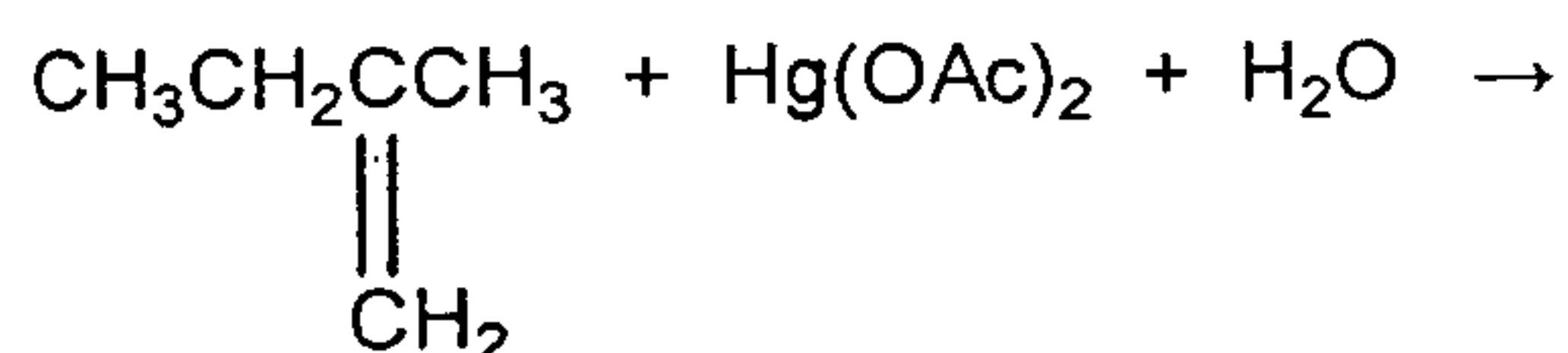
(A)



(B)



(C)



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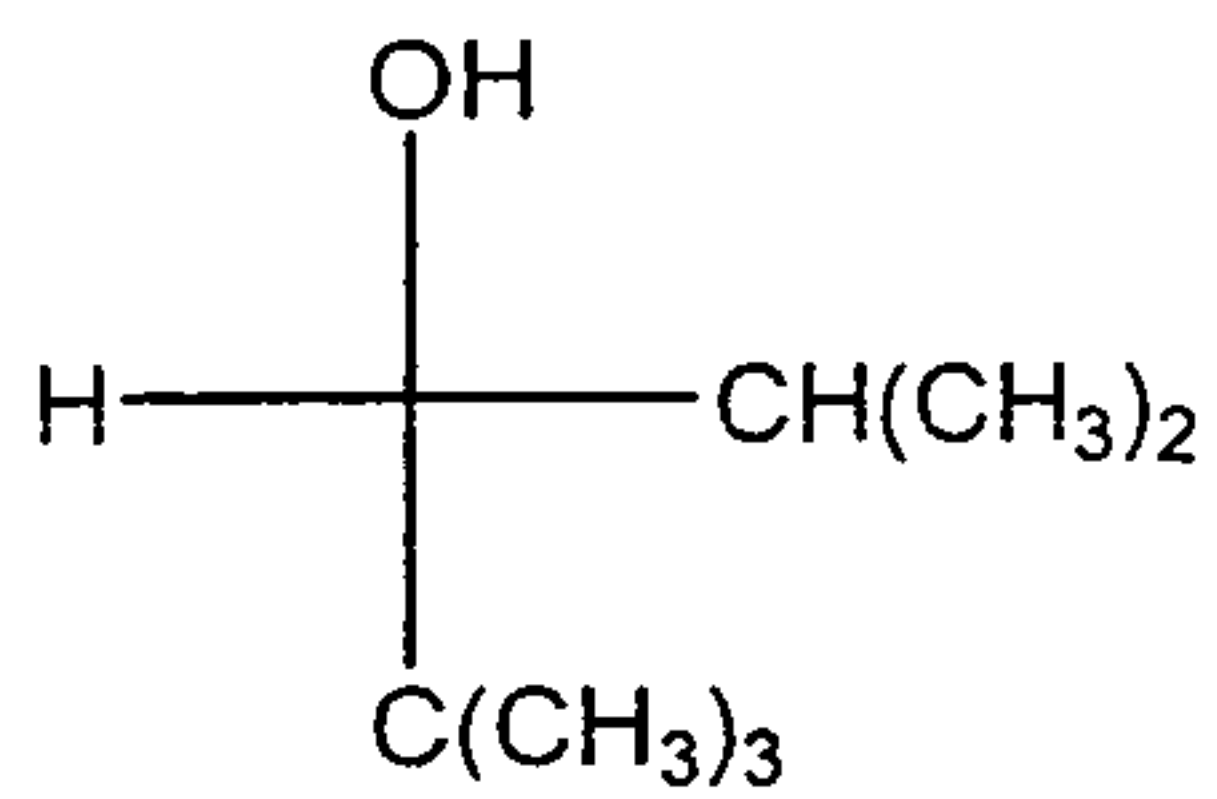
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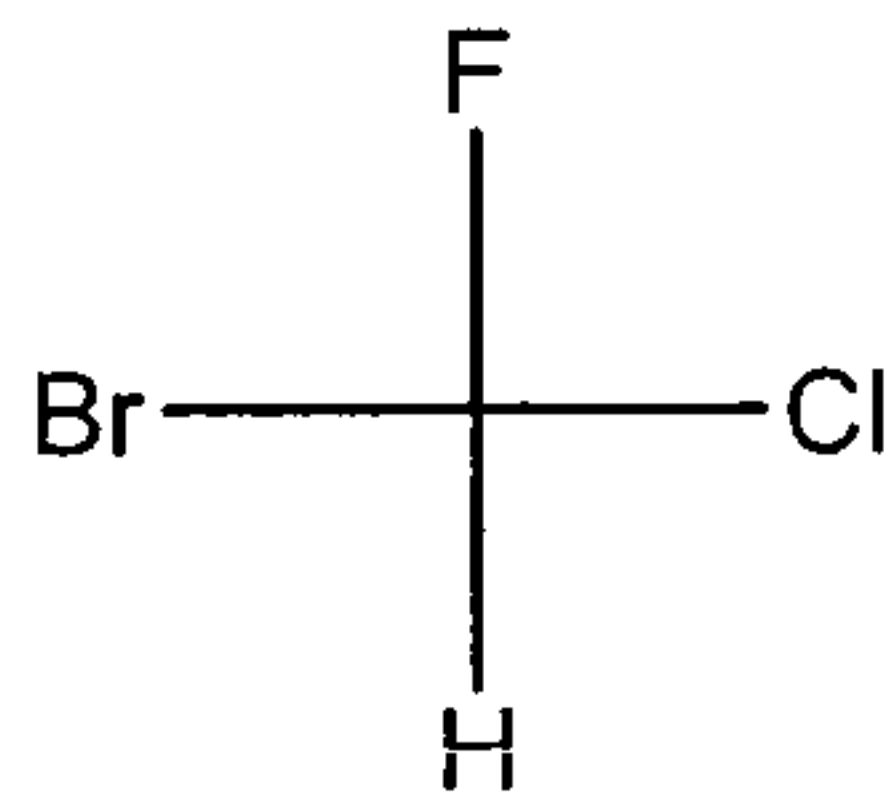
共 11 頁，第 8 頁

22) State whether the configuration of each asymmetric carbon atom is R or S in each of the following Fischer projections. 5pts

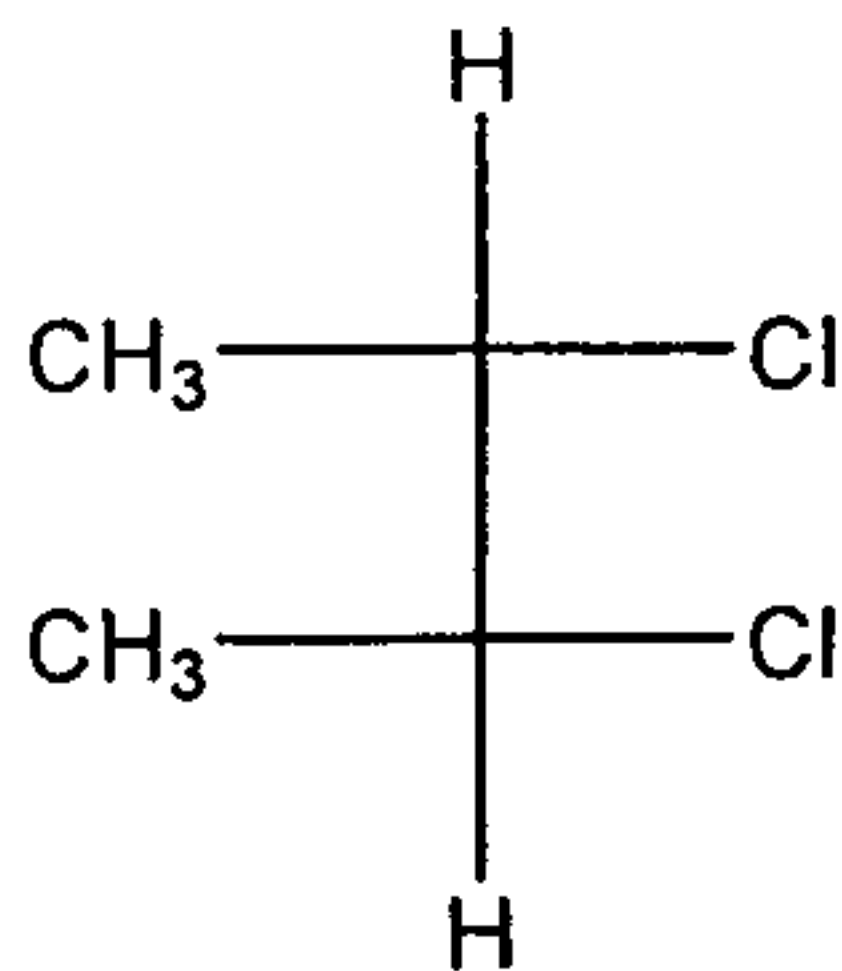
(A)



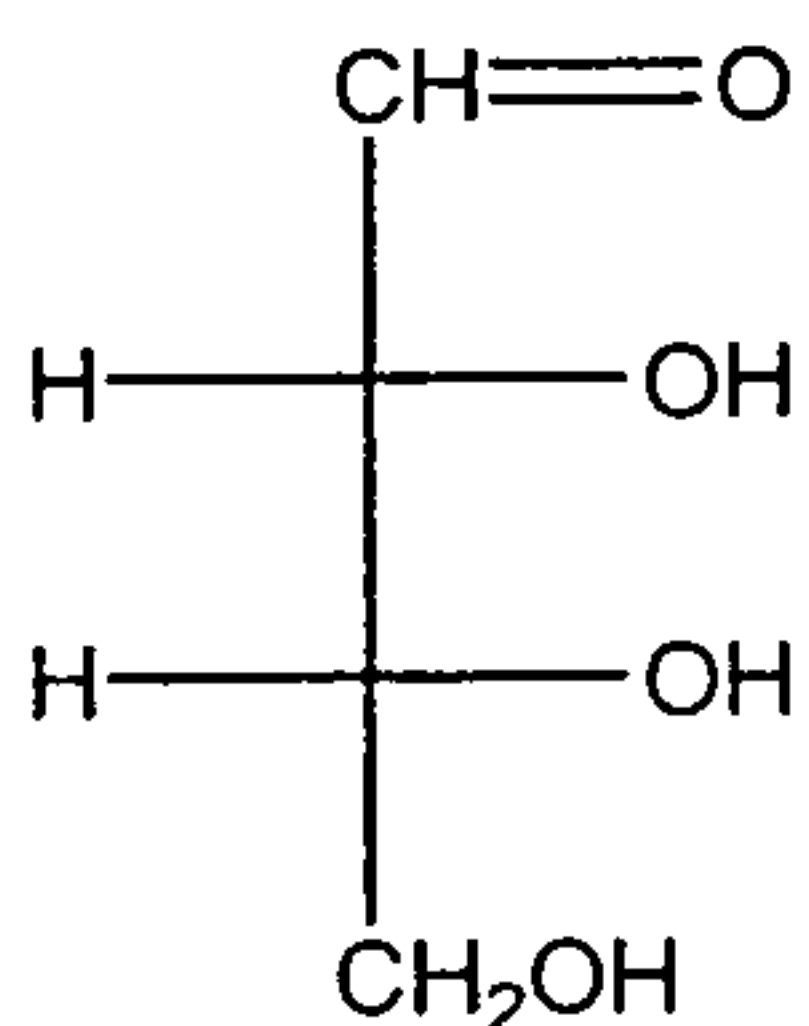
(B)



(C)



(D)



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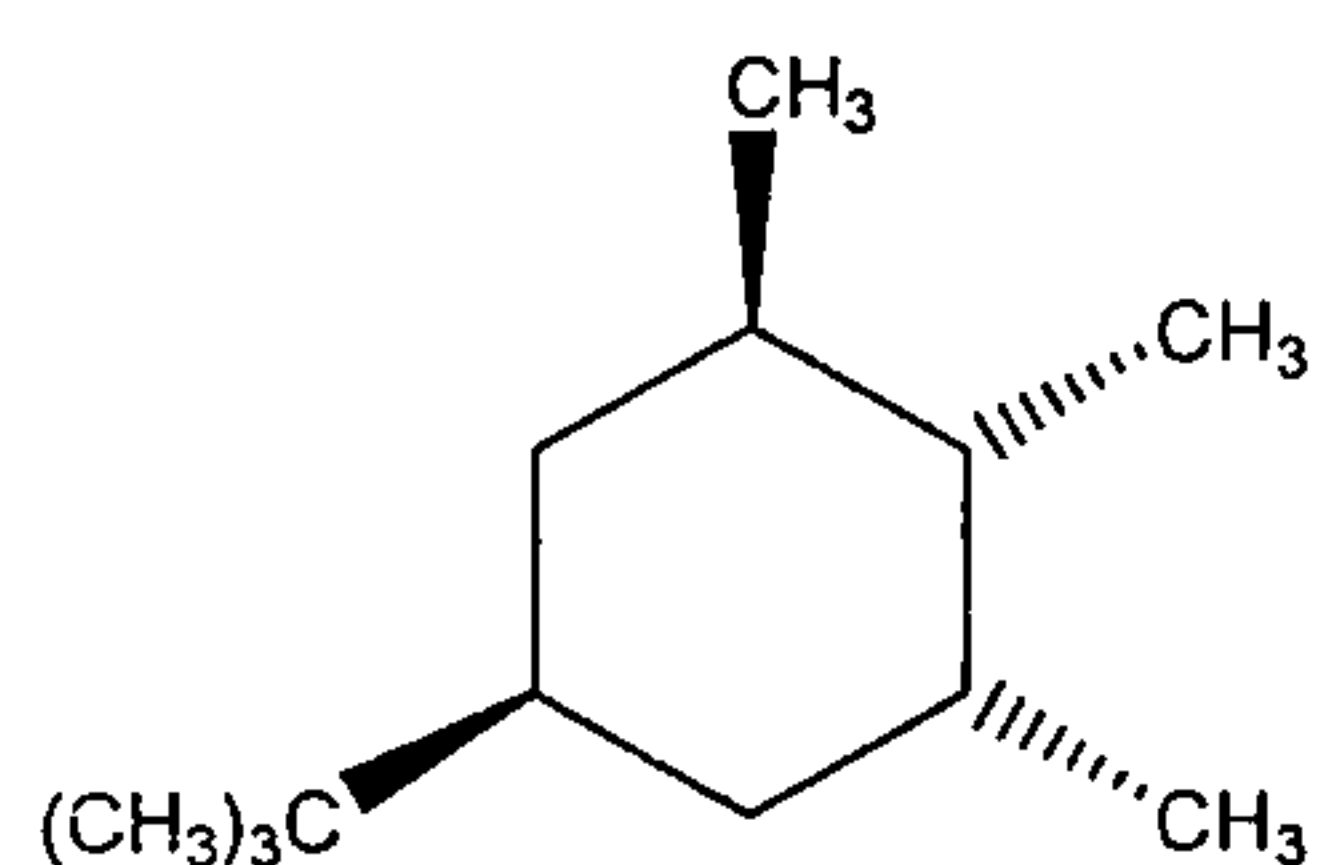
總分 100 分；共 29 題；考試時間 100 分鐘

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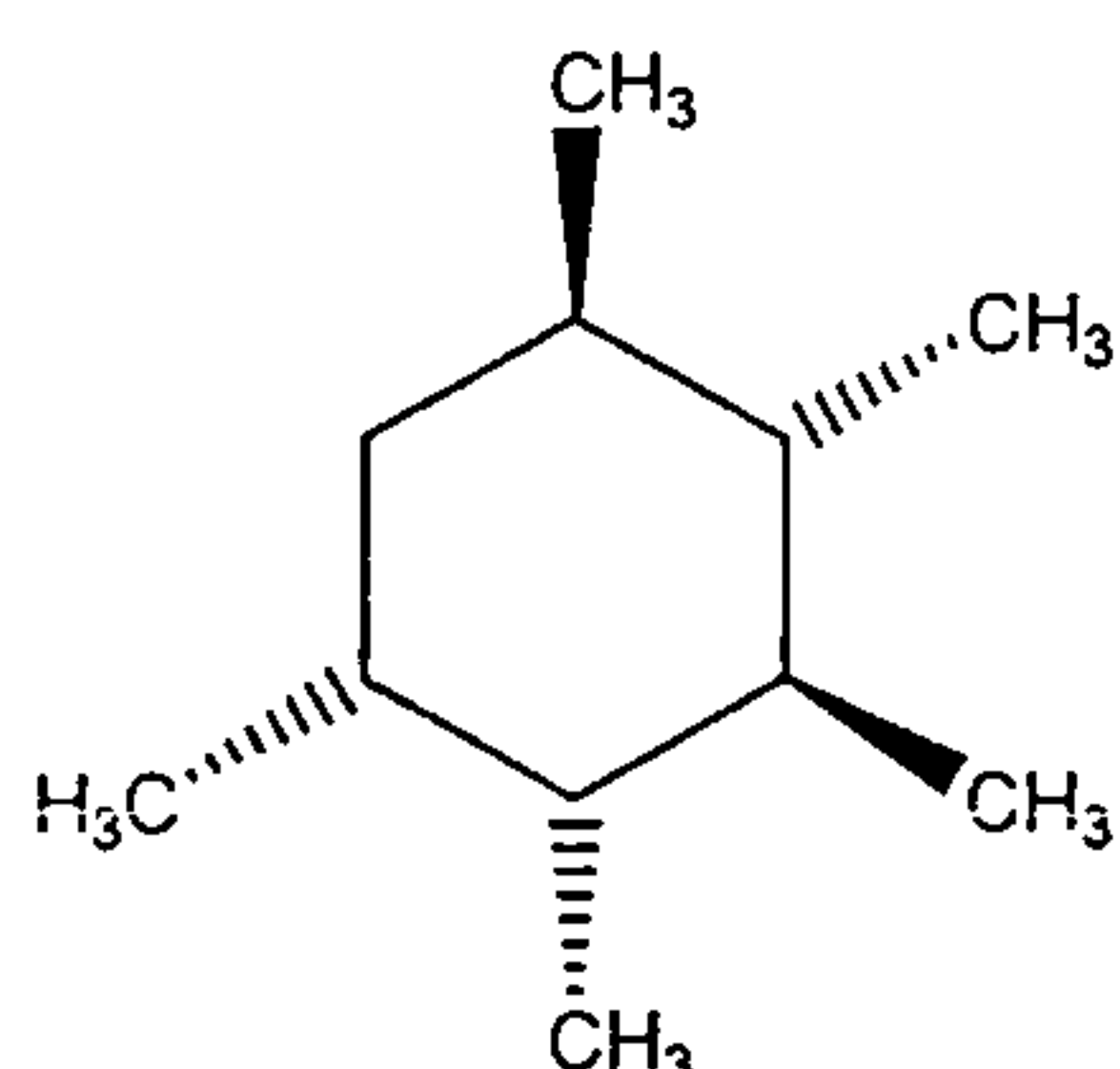
23) Draw a structure of each of the following compounds in its more stable chair conformation.

6pts

(A)



(B)



24) Which of the following substances should be least soluble in ethanol: diethyl ether, methylene chloride, hexane, or 1-octanol? Explain. 2pts

25) Rank the following compounds in order of increasing S_N2 reaction rate with KI in acetone. 6pts

methyl bromide

sec-butyl bromide

3-(bromomethyl)-3methylpentane

A

B

C

1-bromopentane

1-bromo-2-methylbutane

D

E

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26) What products are formed when each of the following ethers reacts with concentrated aqueous HI?

5pts

- (A) 2-ethoxypropane
- (B) diisopropyl ether
- (C) 2-ethoxy-2,3-dimethylbutane
- (D) 1-methoxy-1-methylcyclohexane

27) (A) What is the wavenumber of light with a wavelength of $6.0\mu\text{m}$? 2pts

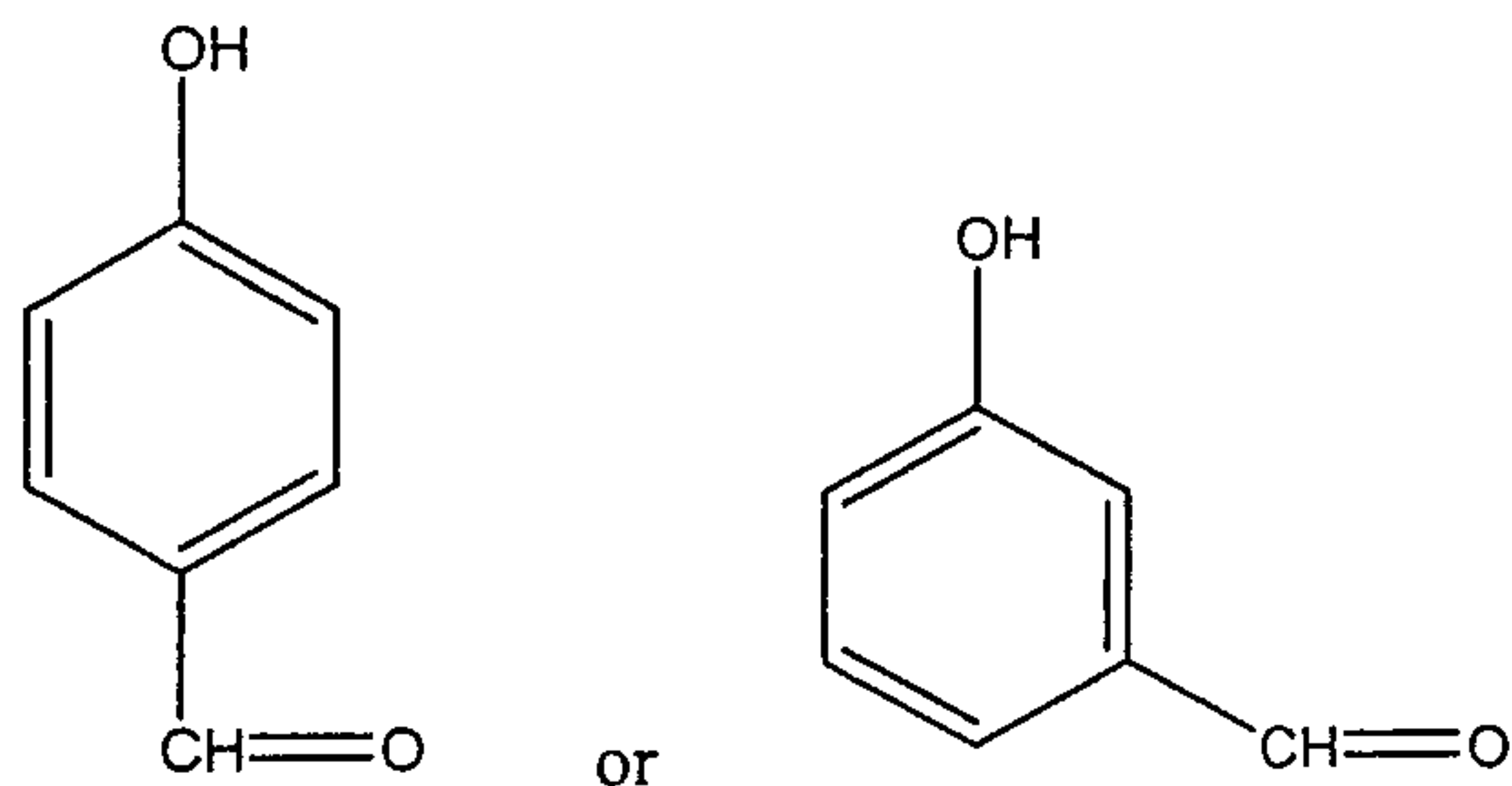
(B) What is the wavelength of light with a wavenumber of 1720cm^{-1} ? 2pts

28) Which of the two phenols in each set is more acidic? Explain. 5pts

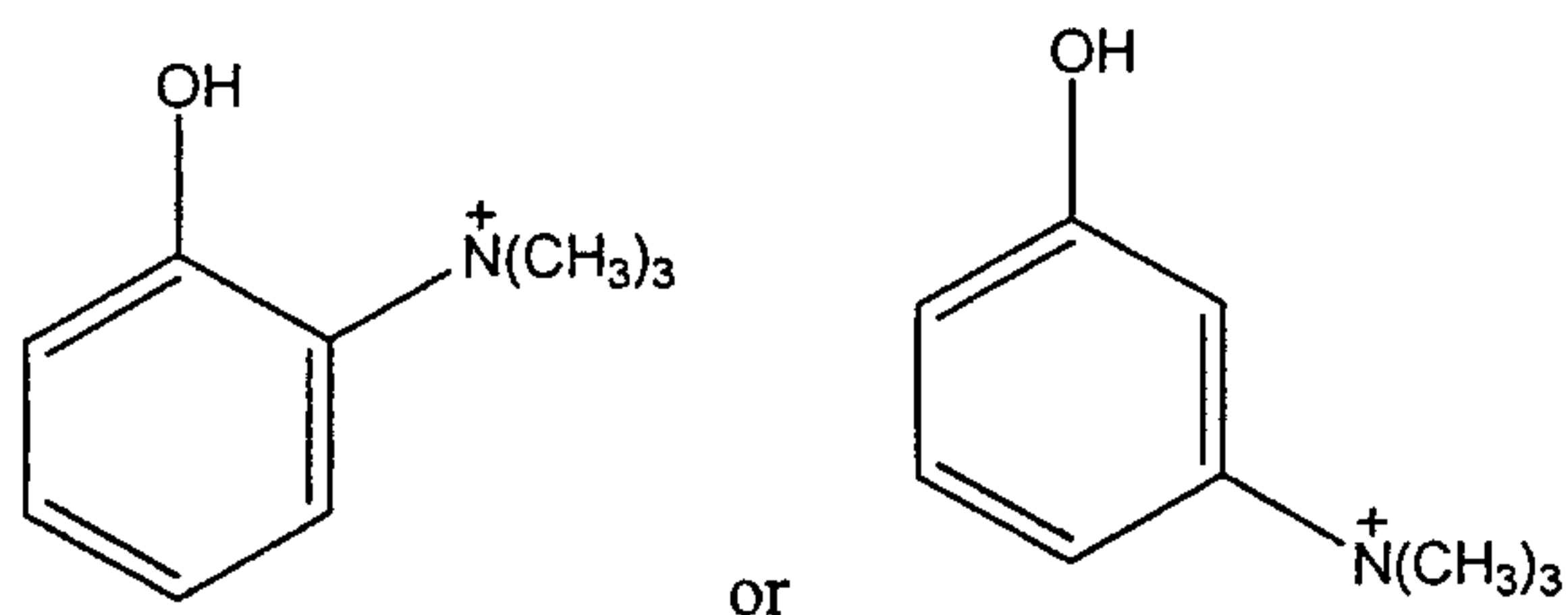
(A) 2,5-dinitrophenol or 2,4-dinitrophenol

(B) phenol or *m*-chlorophenol

(C)



(D)



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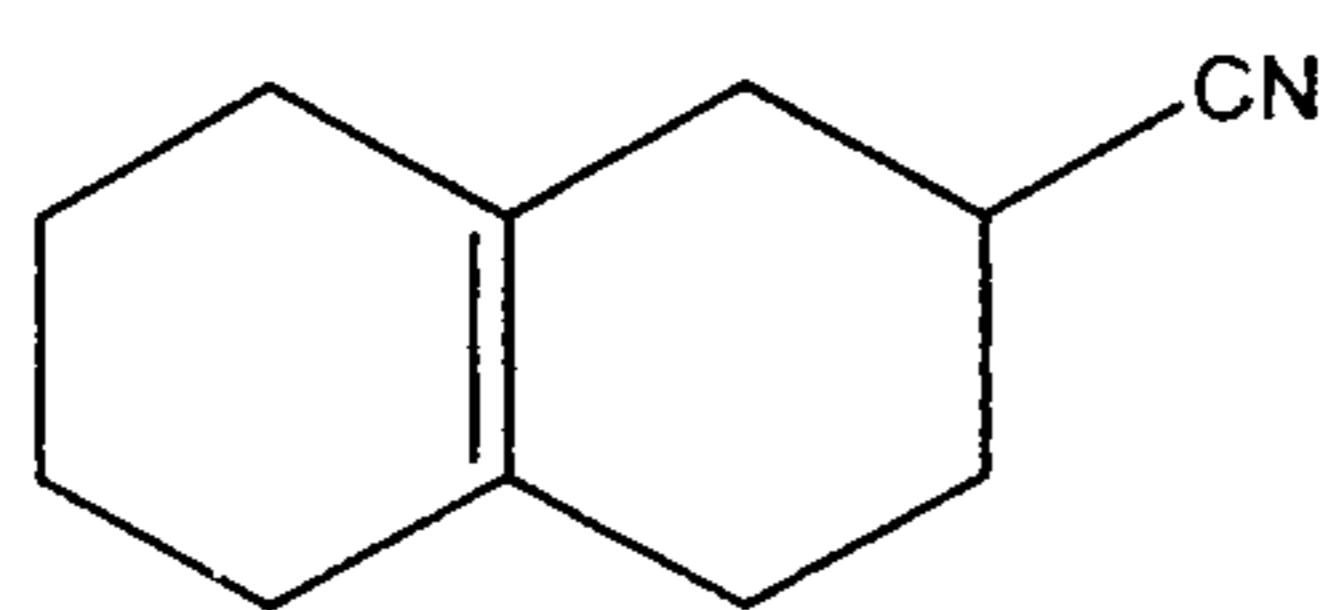
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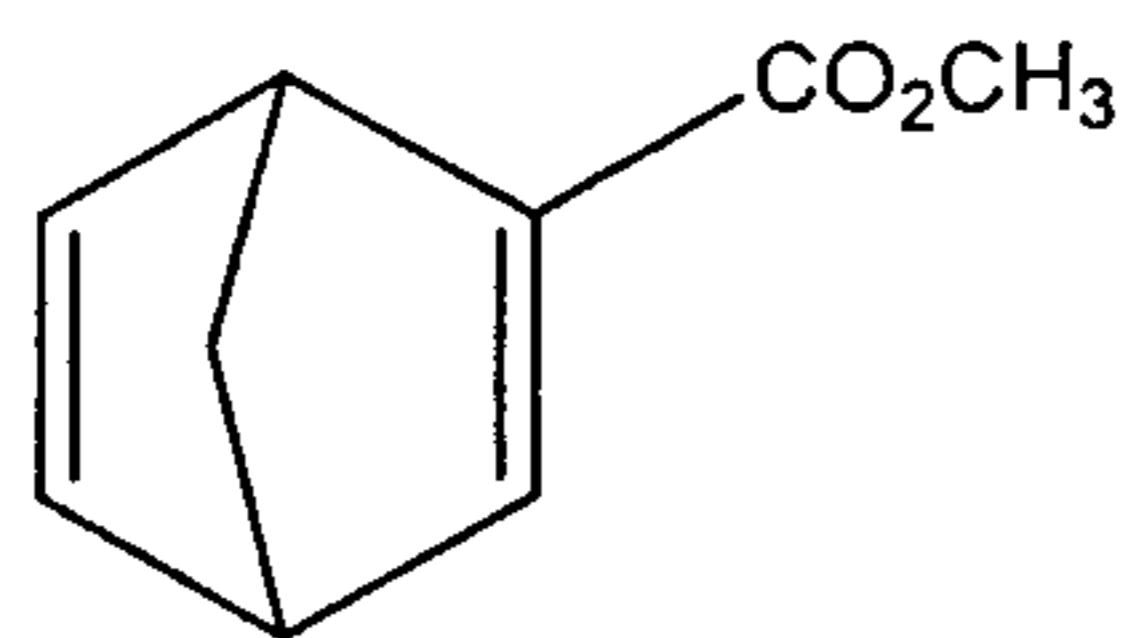
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29) Give the diene and dienophile that would react in a Diels-Alder reaction to give each of the following products. 6pts

(A)



(B)



(C)

