

國立臺灣師範大學 108 學年度碩士班招生考試試題

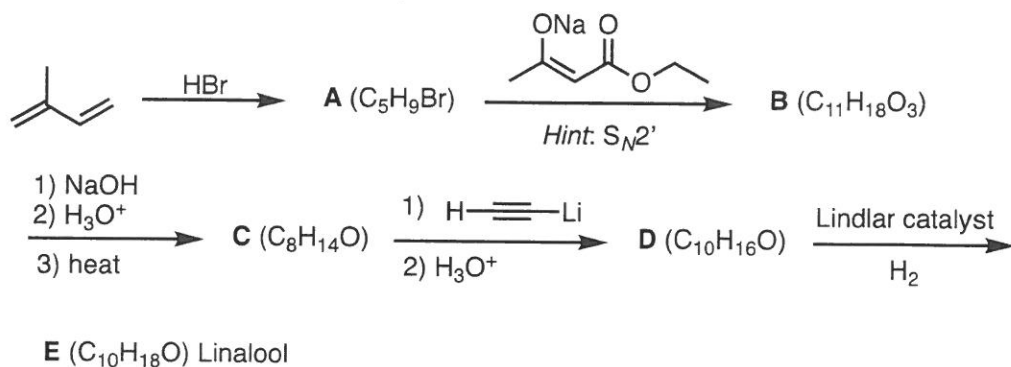
科目：有機化學

適用系所：化學系

注意：1. 本試題共 8 頁，請依序在答案卷上作答，並標明題號，不必抄題。2. 答案必須寫在指定作答區內，否則依規定扣分。

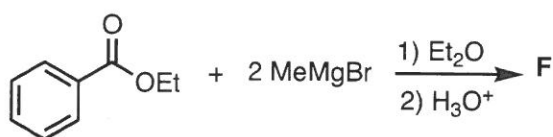
一、非選擇題：(共 50 分)

1. Linalool, a fragrant compound that can be isolated from a variety of plants, is 3,7-dimethyl-1,6-octadien-3-ol. Linalool is used in making perfumes, and it can be synthesized in the following way. Please write down the structures (A–E). (3 points each, 15 points total)

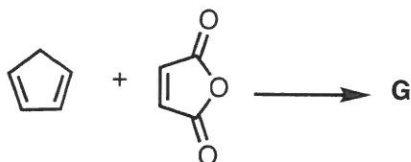


2. Please write down the structure of the major product in the following transformations. Include **stereochemistry** where appropriate. (3 points each, 15 points total)

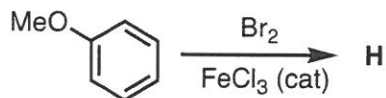
(1)



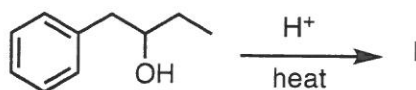
(2)



(3)



(4)



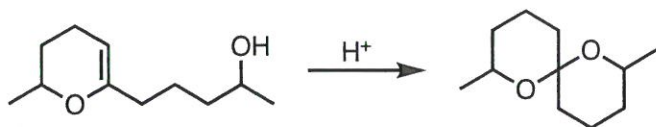
(5)



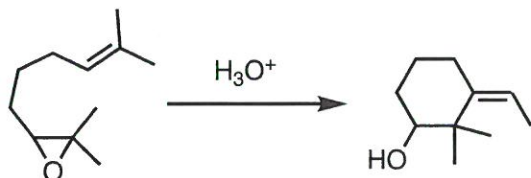
3. Please provide a reasonable mechanism for the following transformations (5 points each, 20 points total)

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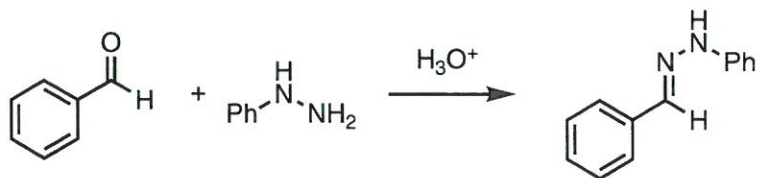
(1)

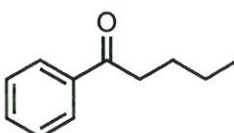
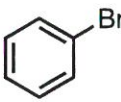



(2)



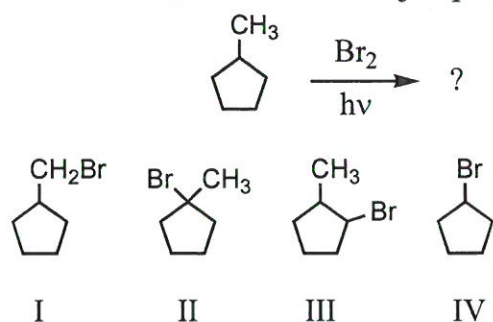
(3)



(4) Suggest a synthesis of  from  and .

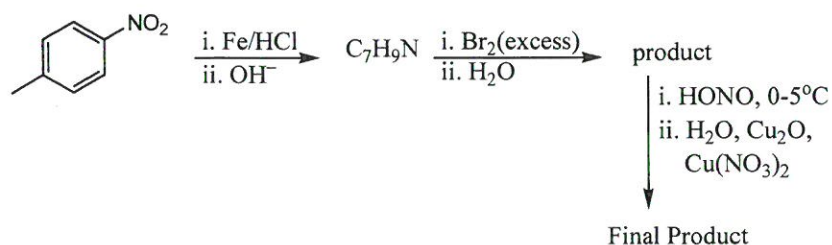
二、單選題 (15 題，每題 2 分，共 30 分)

1. Select the structure of the major product formed in the following reaction.



(A) I (B) II (C) III (D) IV

2. What is the final product of following reactions?

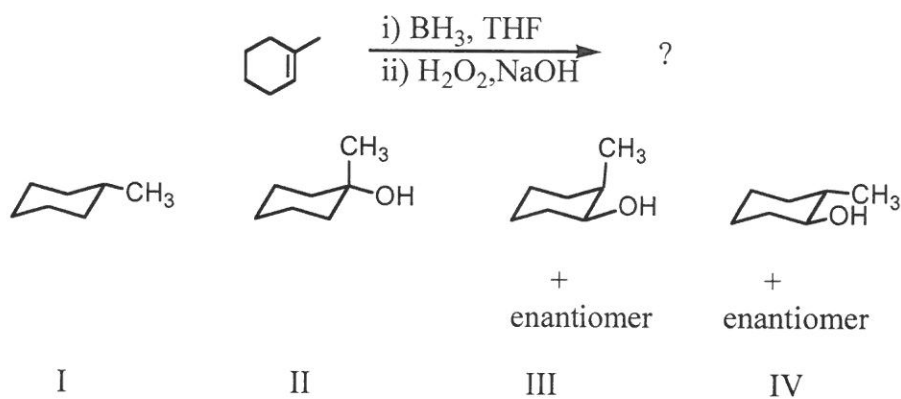


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- (A) 2-Bromo-4-methylaniline
(C) 2,6-Dibromo-4-methylphenol

- (B) 2,6-Dibromo-4-methylaniline
(D) 2,4-Dibromophenol

3. What is the major product of the reaction:



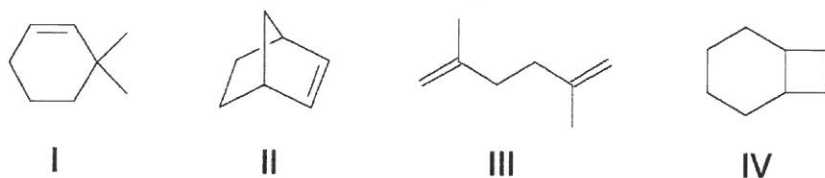
- (A) I (B) II (C) III (D) IV

4. The reaction of 2-methylbut-1-ene with which of the following reagents leads to the formation of an alcohol?

- I. $\text{HBr}/\text{CH}_2\text{Cl}_2$
 II. BH_3 , followed by $\text{H}_2\text{O}_2/\text{NaOH}/\text{H}_2\text{O}$
 III. H_2/Pt
 IV. Br_2
 V. $\text{H}^+/\text{H}_2\text{O}$

- (A) I, II (B) II, III (C) I, IV (D) II, V

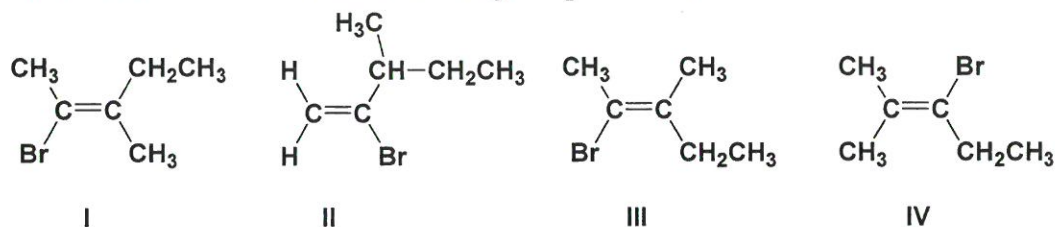
5. Compound A has a molecular formula C_8H_{14} and reacts with H_2/Pt to give compound B, C_8H_{16} . Which is compound A?



- (A) I (B) II (C) III (D) IV

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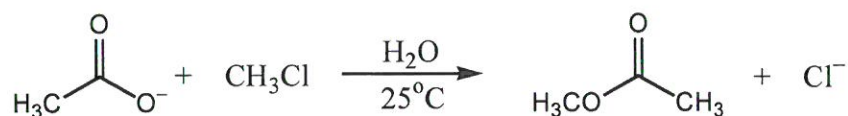
6. Which structure is Z-2-bromo-3-methyl-2-pentene?



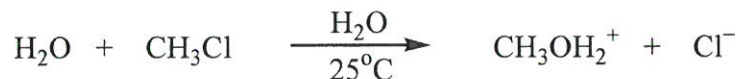
(A) I (B) II (C) III (D) IV

7. Which S_N2 reaction would take place most rapidly?

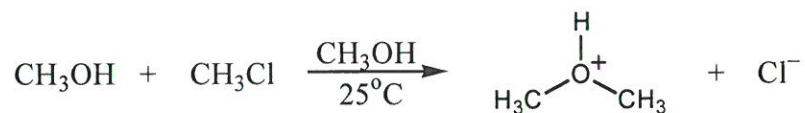
(A)



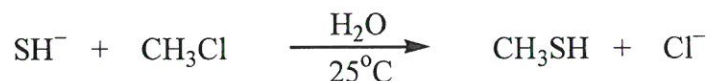
(B)



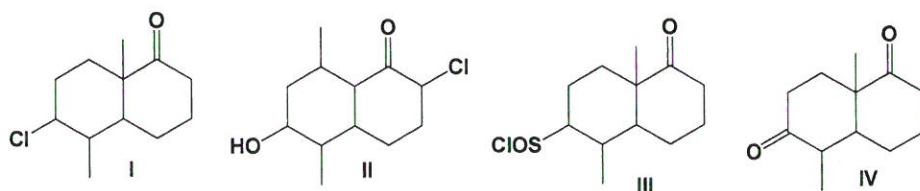
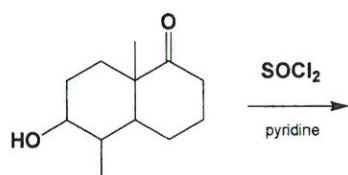
(C)



(D)



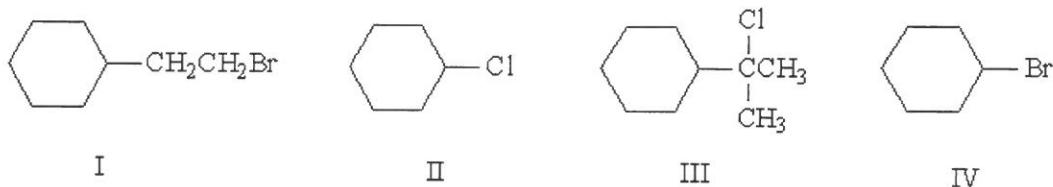
8. Alcohol shown below reacts with thionyl chloride in pyridine. Which organic product is formed?



(A) I (B) II (C) III (D) IV

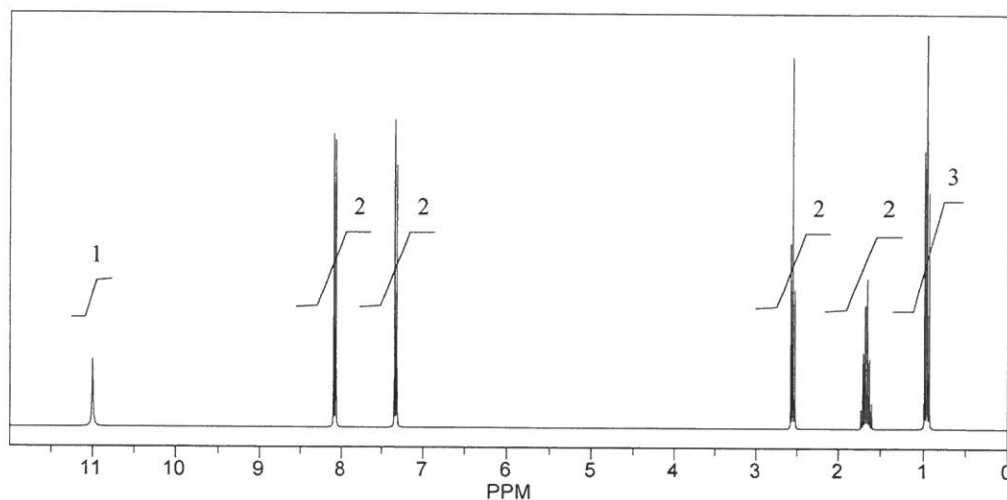
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9. Arrange the haloalkanes in order of increasing reactivity in an S_N2 reaction with KI in acetone (**least first**).

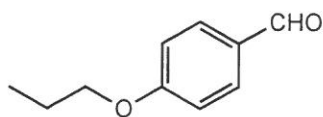


- (A) I < IV < III < II (B) IV < I < III < II (C) II < III < I < IV (D) III < II < IV < I

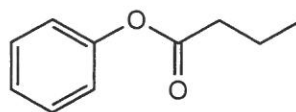
10. What is the structure of the compound in the following ^1H -NMR spectrum with the molecular formula $\text{C}_{10}\text{H}_{12}\text{O}_2$? Relative integration is shown.



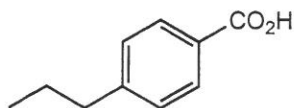
(A)



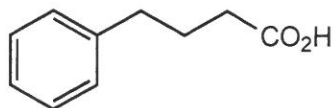
(B)



(C)



(D)

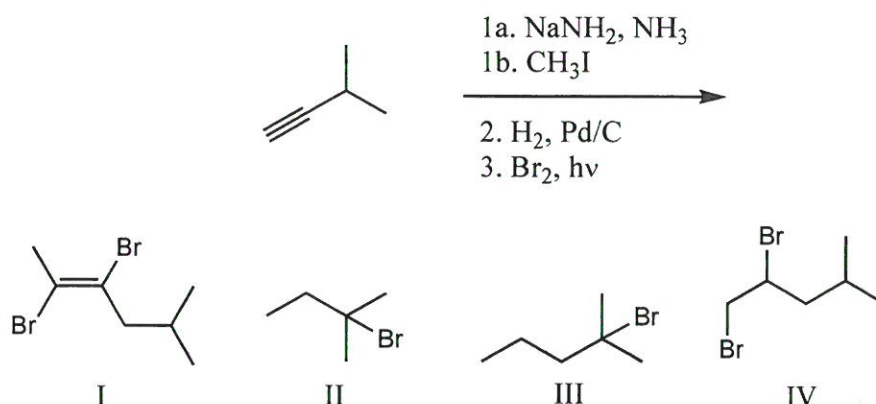


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11. Which of the following would be a reasonable synthesis of 2-butanol?

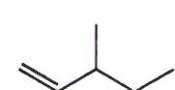
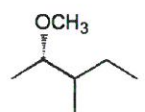
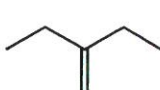
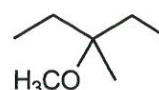
- (A) 1-Butene $\xrightarrow{\text{RCOOH}}$
- (B) 1-Butene $\xrightarrow[2. \text{H}_2\text{O}_2, \text{NaOH}]{1. \text{BH}_3\text{-THF}}$
- (C) 1-Butene $\xrightarrow[2. \text{NaBH}_4, \text{NaOH}]{1. \text{Hg}(\text{OAc})_2, \text{THF}, \text{H}_2\text{O}}$
- (D) 1-Butene $\xrightarrow[2. \text{NaBH}_4, \text{NaOH}]{1. \text{Hg}(\text{OAc})_2/\text{CH}_3\text{OH}}$

12. What is the product for the following three-step reaction sequence?



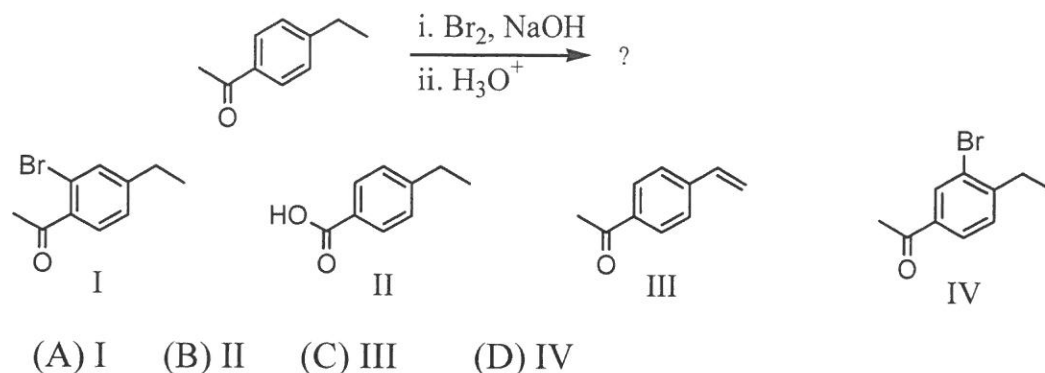
- (A) I (B) II (C) III (D) IV

13. What is the *major* product of the reaction between methanol and (2*R*,3*S*)-2-bromo-3-methylpentane at room temperature?

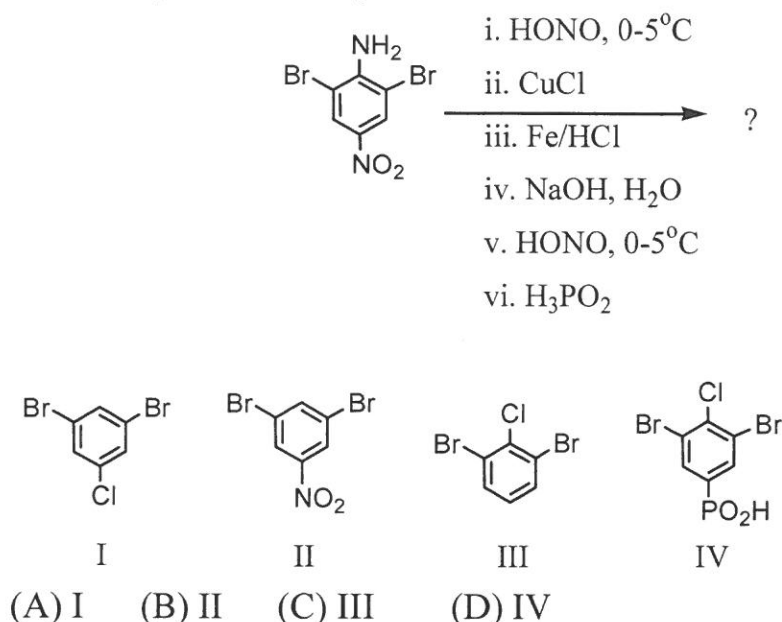
- (A) 
- (B) 
- (C) 
- (D) 

14. What would be the major product of the following reaction?

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15. What compound is likely to be obtained via the following reaction sequence?

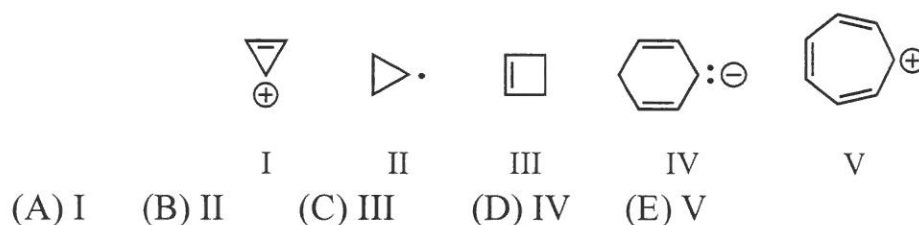


三、複選題 (5 題，每題 4 分，全對才給分，共 20 分)

1. Which of the following is the correct order of increasing nucleophilicity

- (A) $\text{OR}^- > \text{OH}^- > \text{RCOO}^- > \text{ROH}$ (B) $\text{Cl}^- > \text{Br}^- > \text{I}^-$
 (C) $\text{H}_2\text{O} > \text{NH}_3 > \text{OH}^-$ (D) $\text{OH}^- > \text{NH}_3 > \text{H}_2\text{O}$
 (E) $\text{Br}^- > \text{CH}_3\text{O}^- > \text{H}_2\text{O}$

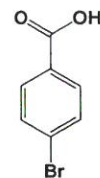
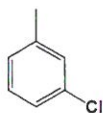
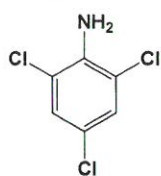
2. Which of the following would you expect to be aromatic?



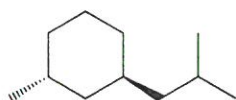
3. Which compounds are named correctly?

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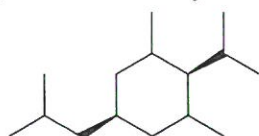
- (A) 2,4,6-trichloroaniline (B) meta-chlorotoluene (C) para-bromophenol



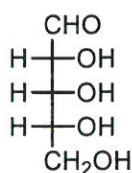
- (D) *trans*-1-isobutyl-3-methylcyclohexane



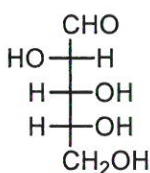
- (E) *cis*-1-isobutyl-2-isopropyl-4,5-dimethylcyclohexane



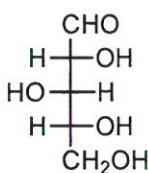
4. Refer to the structures below. Which are L-sugars?



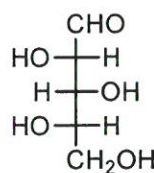
I



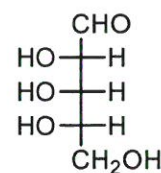
II



III



IV



V

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

5. Which of the following statements about IR spectroscopy are true?

- (A) The $1630\text{--}1800\text{ cm}^{-1}$ region can be used to distinguish between alcohols and carboxylic acids.
 (B) The strength of absorption signal in the $1630\text{--}1680\text{ cm}^{-1}$ region is greater for carbonyl groups than alkene groups.
 (C) Infrared photons cannot turn on a molecule's rotation.
 (D) 3-Hexanone has an IR absorption in the $3200\text{--}3500\text{ cm}^{-1}$ region.
 (E) The $3200\text{--}3500\text{ cm}^{-1}$ region can be used to distinguish between alcohols and amines by frequency alone.