

國立臺灣師範大學 101 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

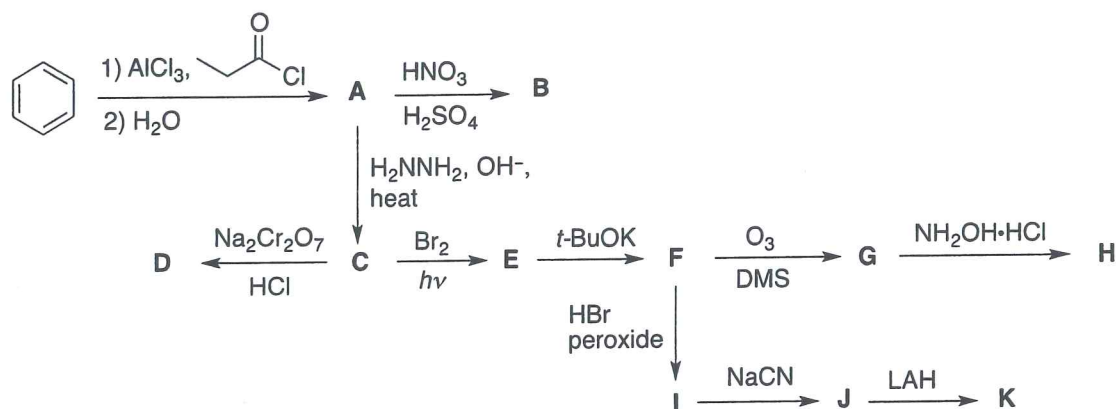
注意：1.本試題共 6 頁，請依序在答案卷上作答，並標明題號，不必抄題。2.答案必須寫在指定作答區內，否則依規定扣分。

答題注意事項：作答時需按題號順序依次作答，每大題內的小題亦需按小題號順序作答，否則皆不予計分。

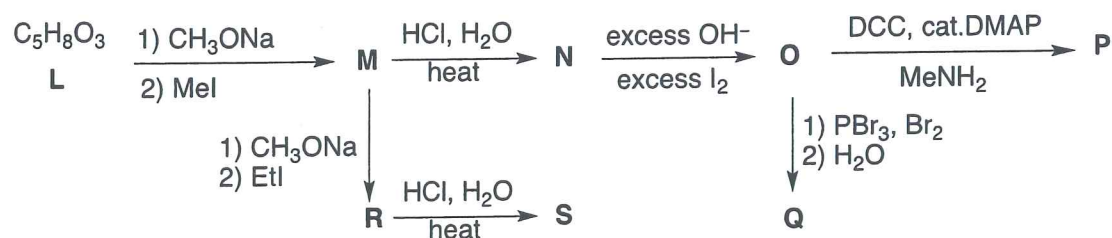
一、非選擇題(共 64 分)

1. A chemist isolated a compound with molecular formula $C_6H_4Br_2$ and its 1H -NMR spectrum shows peaks below 7 ppm. This compound was treated with nitric acid and sulfuric acid and isolated three different isomers with molecular formula $C_6H_3Br_2NO_2$. What was the structure of the original compound? (2 分)

2. Please identify the structure of the following transformations: (各 2 分)

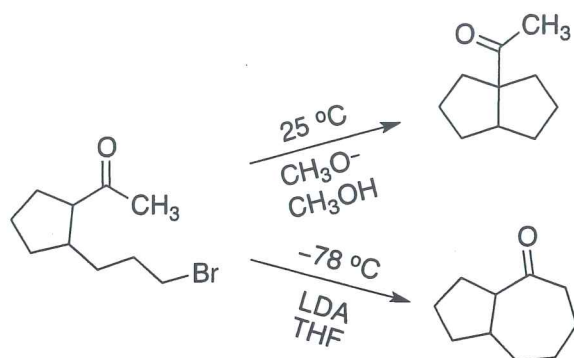


3. A compound L with molecular formula $C_5H_8O_3$ shows three singlets in its 1H -NMR spectrum with integration ratios 3:2:3 and gives a positive iodoform test. This compound and its derivatives were treated with reagents shown below. Please identify their structure. (各 2 分)

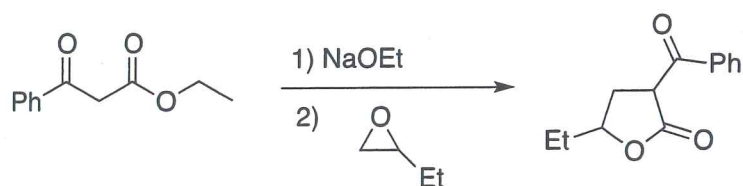


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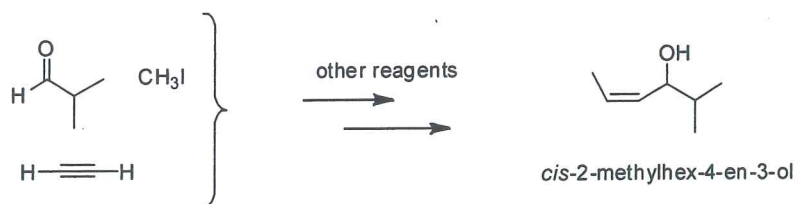
4. Please explain the reasons of observing two different bicyclic compounds under the reaction conditions: (5 分)



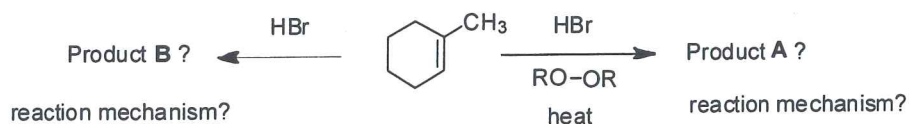
5. Proposed a reasonable mechanism for the following reaction. (5 分)



6. Write down the right products and reagents in every step starting from starting materials to the desired product. More than one step with different reagents is needed. (7 分)

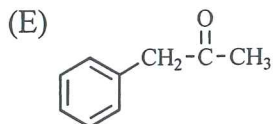
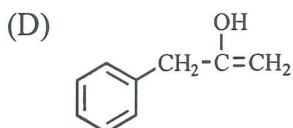
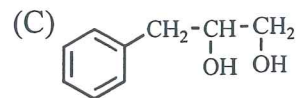
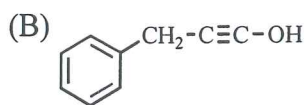
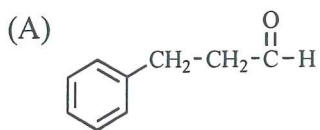
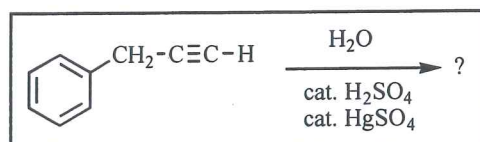


7. Write down the desired products and reasonable reaction mechanisms. (7 分)



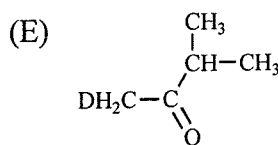
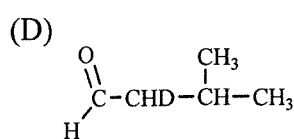
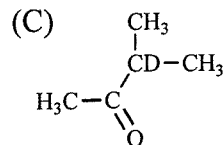
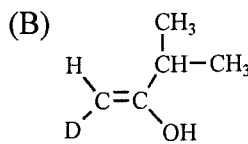
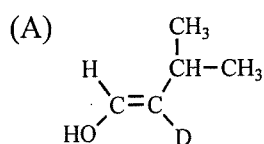
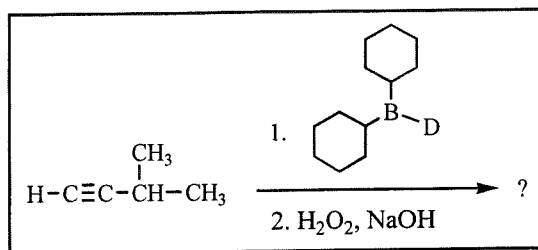
二、選擇題 (每題 2 分，共 36 分)

1. What would be the product of the following reaction?

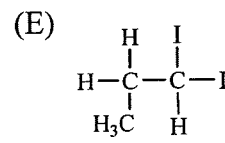
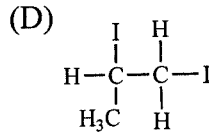
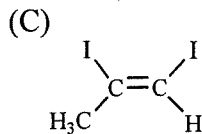
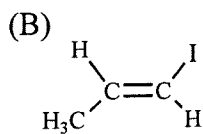
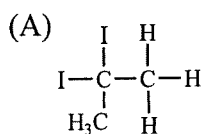
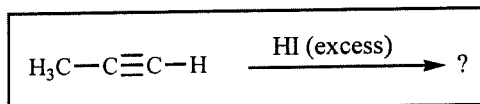


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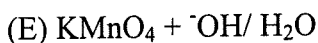
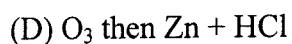
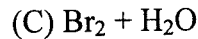
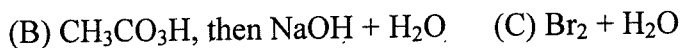
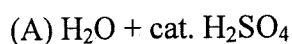
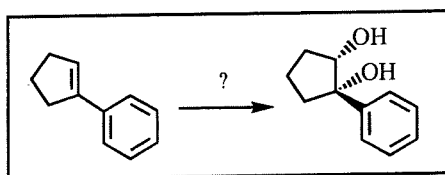
2. What would be the **major** product expected from the following reaction? (Notice the D isotope.)



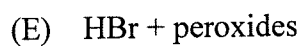
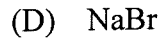
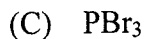
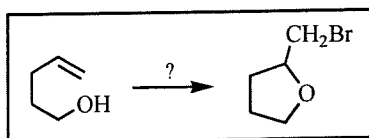
3. What major product(s) are expected from the reaction shown below?



4. Which of the reagents below would best accomplish the following transformation?

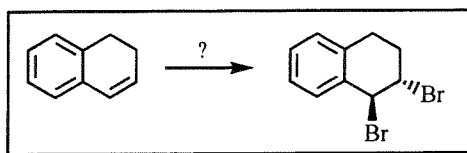


5. Based on your knowledge of the mechanisms involved, which of the reagents below would you expect to accomplish the following reaction?



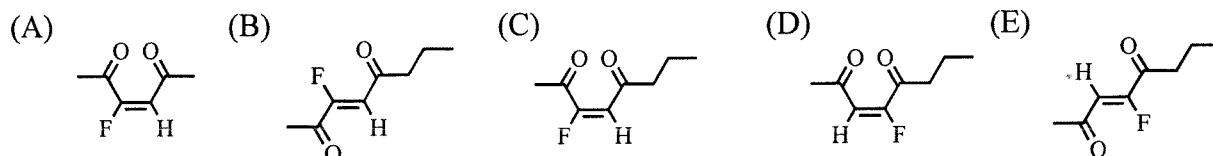
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6. What reagent(s) would accomplish the following reaction?

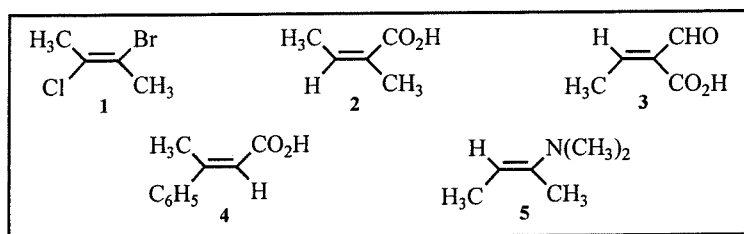


- (A) Br_2 (B) NBS (C) $\text{Br}_2 + \text{light}$ (D) $\text{Br}_2 + \text{FeBr}_3$ (E) HBr

7. Which of the following structures represents: (Z)-3-fluoro-3-octen-2,5-dione?

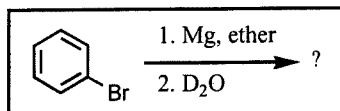


8. Which of the following are (E) isomers?



- (A) 1, 3, and 5 (B) 2, 4, and 5 (C) 1, 4, and 5 (D) 1, 2, and 4 (E) 2, 3, and 4

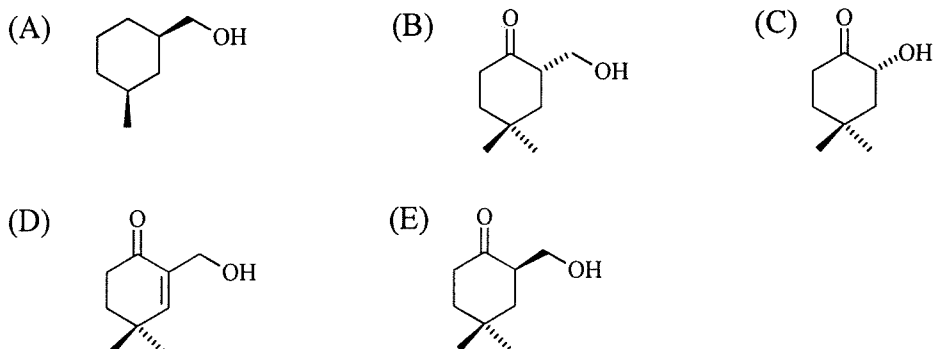
9. What would be the expected product(s) of the following reactions?



- (A) $\text{C}_6\text{H}_5\text{OH}$ (B) $\text{C}_6\text{H}_5\text{D}$ (C) $\text{C}_6\text{H}_5\text{OD}$ (D) C_6H_6 (E) both A and C

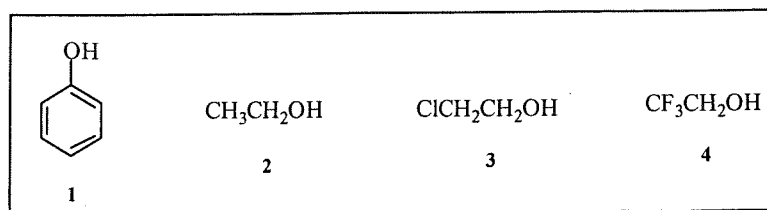
10. Which is the correct structure for the following IUPAC name?

(2S) - 2-(hydroxymethyl)-4,4-dimethylcyclohexanone



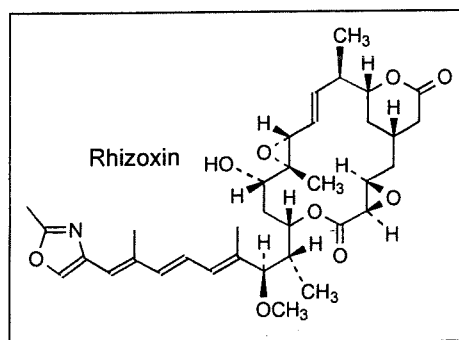
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11. Rank the following organic compounds in order of increasing acidity.



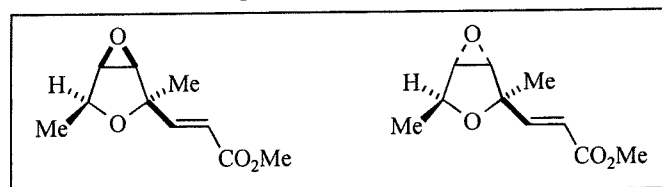
- (A) $1 < 4 < 3 < 2$ (B) $1 < 3 < 4 < 2$ (C) $2 < 1 < 3 < 4$ (D) $2 < 3 < 4 < 1$ (E) $1 < 4 < 2 < 3$

12. How many stereogenic (chiral) centers are found in Rhizoxin?



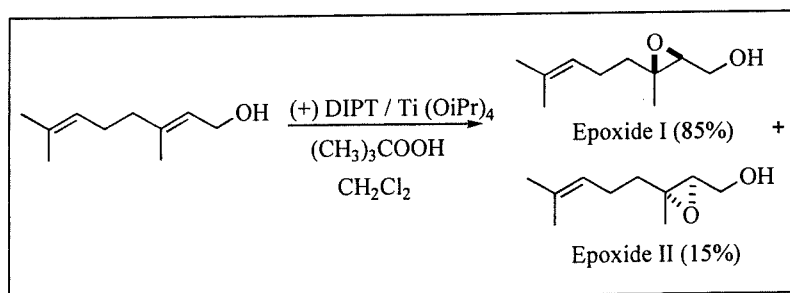
- (A) 5 (B) 7 (C) 9 (D) 11 (E) 14

13. The relationship between the following two compounds is:



- (A) same molecule (B) enantiomers (C) diastereomers (D) meso compounds
(E) conformers

14. Sharpless epoxidation of geraniol gave two products, epoxide I (85%) and epoxide II (15%). This mixture of epoxides represents what percent optical purity (or percent enantiomeric excess, % ee)?



- (A) 0% (B) 15% (C) 70% (D) 85% (E) 100%

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15. (*S*)-Naproxen, $[\alpha]_D = +66^\circ$, is an analgesic (pain reliever), while its enantiomer is toxic. Say that you were given a solution that contains 1 g of Naproxen in 20 mL of liquid, but the optical purity is not specified. You place it in a polarimeter tube (10 cm) and get a reading of $+3.3^\circ$ from the polarimeter. What is the percent optical purity of the sample?

- (A) 50 (B) 100 (C) 0 (D) 10 (E) 75

16. Although five- and six-membered rings are generally the most stable, why is cyclopentane less stable than cyclohexane?

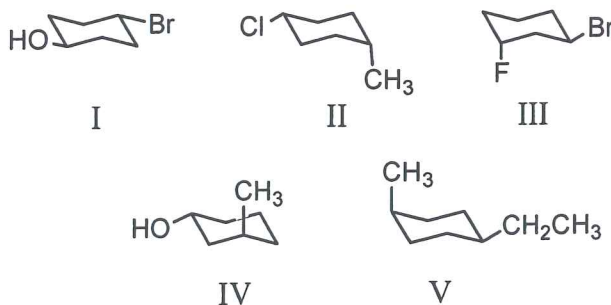
- (A) The angles in cyclopentane deviate significantly from the tetrahedral angle.
 (B) Five-membered rings have trans annular interactions.
 (C) Five-membered rings have eclipsing hydrogens.
 (D) Planar cyclohexane has bond angles closer to 109° .
 (E) Larger rings are always more stable than smaller rings.

17. Which is the correct name for the compound shown below?



- (A) Bicyclo[2.2.0]hexane (B) Bicyclo[2.2.0]butane (C) Bicyclo[2.2.2]hexane
 (D) Bicyclo[2.2.1]hexane (E) None of them above are correct.

18. Which of the following can be described as *cis* isomers?



- (A) I (B) II, V (C) III, IV (D) I, III and IV (E) None of the above are *cis* isomers.