

# 東海大學 104 學年度碩士班招生考試試題

考試科目：有機化學

應考系組：化學系化學組、化學系化生組 科目代碼：22021

考試日期：104 年 03 月 08 日 第 2 節 使用計算機：可

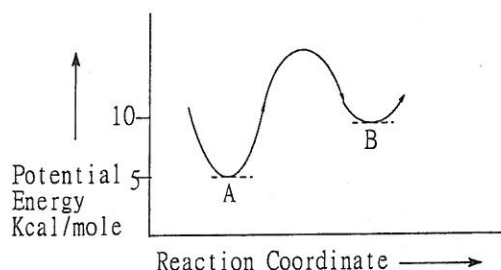
共 4 頁，第 1 頁

一. 單選選擇題(80%, 請於答案卷上依序作答, 答對每題給4分, 答錯不倒扣)

1 Which of the following molecules is the strongest acid?

- A.  $\text{CH}_3\text{CH}_2\text{OH}$     B.  $\text{CH}_3\text{OCH}_3$     C.  $(\text{CH}_3)_2\text{NH}$     D.  $(\text{CH}_3)_3\text{N}$     E.  $\text{CH}_3\text{CH}_3$

2 Which of the following statements describes the reaction  $\text{A} \rightarrow \text{B}$ ? Use the reaction diagram shown.



- A.  $\Delta H = +5$  Kcal/mole; the reaction is exothermic.  
 B.  $\Delta H = -5$  Kcal/mole; the reaction is endothermic.  
 C.  $\Delta H = +5$  Kcal/mole; the reaction is endothermic.  
 D.  $\Delta H = -5$  Kcal/mole; the reaction is exothermic.  
 E.  $\Delta H = -10$  Kcal/mole; the reaction is exothermic.

3 The specific rotation of pure (-)-2-methyl-1-butanol is  $-5.90^\circ$ . What is the specific rotation of a mixture containing 75% of this isomer and 25% of the (+)-isomer?

- A.  $-5.90^\circ$     B.  $-4.43^\circ$     C.  $-2.95^\circ$     D.  $-1.48^\circ$     E.  $4.43^\circ$

4 Structures X and Y are stereoisomers. They are not superimposable and are not mirror images of one another. What best describes the relationship between X and Y?

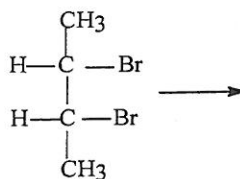
- A. Diastereomers    B. Enantiomers    C. Structural isomers    D. Conformers    E. Geometric isomers

5 Which of the following statements about (R)-2-methyl-1-butanol can **only** be confirmed by performing an experiment?

- A. It rotates a plane of polarized light to the right.  
 B. An equal mixture of it and its enantiomer is optically inactive.  
 C. (S)-2-methyl-1-butanol has the same boiling point.  
 D. (S)-2-methyl-1-butanol reacts with HCl at the same rate.  
 E. (S)-2-methyl-1-butanol has the same number of degrees of rotation of polarized light.

6 What is (are) the product(s) of the reaction shown if  $\text{Br}_2$  is eliminated, and the stereochemistry of the elimination is **anti**?

- A. Cis and trans-2-butene in 1:2 ratio.  
 B. cis-2-butene only.  
 C. cis and trans-2-butene in equal amounts.  
 D. cis and trans-2-butene in unequal amounts.  
 E. trans-2-butene only.



# 東海大學 104 學年度碩士班招生考試試題

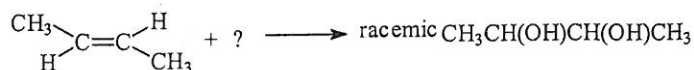
考試科目：有機化學

應考系組：化學系化學組、化學系化生組 科目代碼：22021

考試日期：104 年 03 月 08 日 第 2 節 使用計算機：可

共 4 頁，第 2 頁

7 Which of the following reagents will give the reaction shown?



- A. Cold aqueous  $\text{KMnO}_4$   
 B.  $2\text{H}_2\text{O}$ ,  $\text{H}_2\text{SO}_4$   
 C.  $2\text{KOH}$ ,  $\text{CH}_3\text{CH}_2\text{OH}$   
 D.  $\text{HCOOOH}$   
 E. None of the above.

8 What is (are) the reaction product(s) when isotopically labeled propene,  $\text{CH}_3\text{CH}=\text{}^{14}\text{CH}_2$ , reacts with NBS (N-bromosuccinimide)?

I.  $\text{BrCH}_2\text{CH}=\text{}^{14}\text{CH}_2$  II.  $\text{CH}_2=\text{CH}-\text{}^{14}\text{CH}_2\text{Br}$  III.  $\text{CH}_3\text{CHBr}-\text{}^{14}\text{CH}_2\text{Br}$  IV.  $\text{BrCH}_2\text{CHBr}-\text{}^{14}\text{CH}_3$

- A. I and II in approximately equal amounts  
 B. III and IV in approximately equal amounts.  
 C. I and III in approximately equal amounts  
 D. I only E. III only

9 Which of the following sequences is the best synthesis of propynes,  $\text{CH}_3\text{C}\equiv\text{CH}$ , from propane,  $\text{CH}_3\text{CH}_2\text{CH}_3$ ?

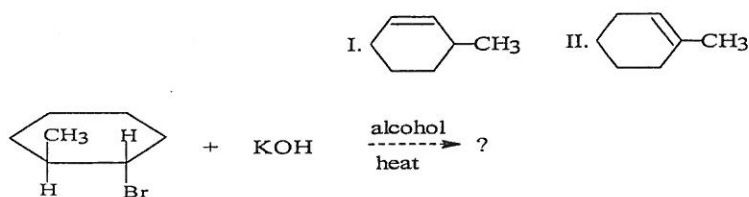
- A.  $\xrightarrow{\text{Br}_2, \text{light}}$   $\xrightarrow{\text{KOH, alcohol}}$   $\xrightarrow{\text{Br}_2, \text{CCl}_4}$   $\xrightarrow{2\text{NaNH}_2}$   
 B.  $\xrightarrow{\text{KOH, alcohol}}$   $\xrightarrow{\text{HBr}}$   $\xrightarrow{2\text{NaNH}_2}$   
 C.  $\xrightarrow{\text{HBr}}$   $\xrightarrow{\text{KOH, alcohol}}$   $\xrightarrow{\text{Br}_2, \text{CCl}_4}$   $\xrightarrow{2\text{NaNH}_2}$   
 D.  $\xrightarrow{\text{H}_2\text{SO}_4, \text{heat}}$   $\xrightarrow{\text{HBr}}$   $\xrightarrow{2\text{NaNH}_2}$   
 E.  $\xrightarrow{\text{HBr}}$   $\xrightarrow{\text{KOH, alcohol}}$   $\xrightarrow{2\text{NaNH}_2}$

10 Which of the following molecules does **not** have the empirical formula  $\text{CH}_2$ ?

- A. Cyclobutane B.  $\text{H}_2\text{C}=\text{CHCH}_2\text{CH}_3$  C. methylcyclohexane  
 D. cyclopentene E. 1,2-dimethylcyclopropane

11 Which of the compounds to the right is (are) the product(s) of the reaction shown?

- A. I(major), II (minor)  
 B. II(major), I(minor)  
 C. I and II equally.  
 D. I only  
 E. II only



# 東海大學 104 學年度碩士班招生考試試題

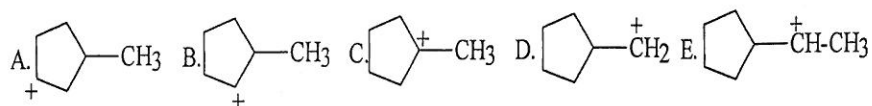
考試科目：有機化學

應考系組：化學系化學組、化學系化生組 科目代碼：22021

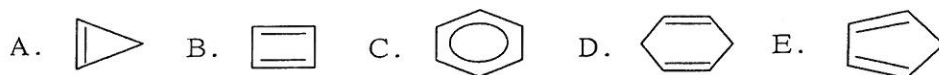
考試日期：104 年 03 月 08 日 第 2 節 使用計算機：可

共 4 頁，第 3 頁

12 Which of the following carbocations forms most **slowly** from the corresponding alkyl bromide?



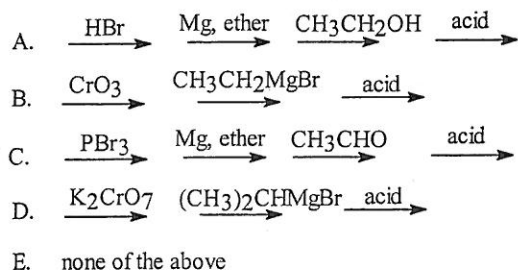
13 Which of the following compounds is the strongest **acid**?



14 Which of the following free radicals is the most stable?



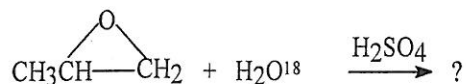
15 Which of the following sequences yields 3-methyl-2-pentanol,  $CH_3CH_2CH(CH_3)CHOHCH_3$ , from 2-butanol?



16 An aldehyde was prepared by the oxidation of a primary alcohol using  $CrO_3$ , and the crude product was isolated. The most likely contaminant was removed by washing with:

- A. cold  $KMnO_4$  B. dilute  $HNO_3(aq)$  C. dilute  $NaOH(aq)$   
 D. cold  $NaBH_4(aq)$  E. cold  $H_2O$

17 What is the major product of the reaction shown?



- A.  $CH_3CH_2CH_2O^{18}H$  B.  $CH_3CH_2CH_2OH$   
 C.  $CH_3CH(O^{18}H)CH_2OH$  D.  $CH_3CH(OH)CH_2^{18}OH$   
 E.  $CH_3CH(O^{18}H)CH_2O^{18}H$

# 東海大學 104 學年度碩士班招生考試試題

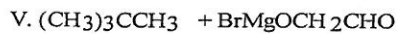
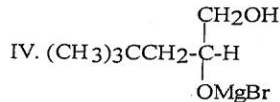
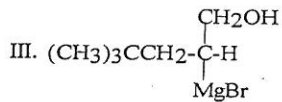
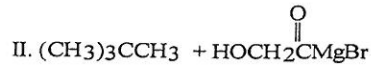
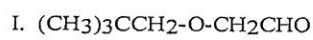
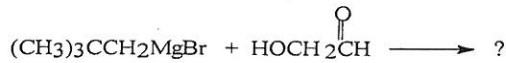
考試科目：有機化學

應考系組：化學系化學組、化學系化生組 科目代碼：22021

考試日期：104 年 03 月 08 日 第 2 節 使用計算機：可

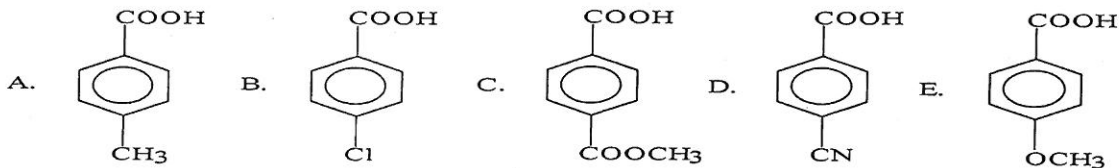
共 4 頁，第 4 頁

18 What is (are) the major products of the reaction shown?

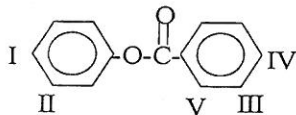


A. I B. II C. III D. IV E. V

19 Which of the following is the **weakest** acid?

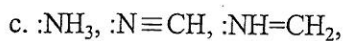
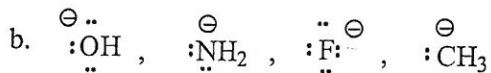
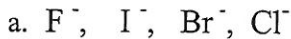


20 Which of the indicated positions in the molecule shown is **most** reactive toward electrophilic aromatic substitution?



A. I B. II C. III D. IV E. V

二. Arrange the following compounds in order of decreasing basicity. (需要解釋)(15%, 答對每題給5分)



三. Give the structure of 18-crown-6, and state its function (Give an example to illustrate)(5%).