

國立臺北科技大學 108 學年度碩士班招生考試

系所組別：3710 分子科學與工程系有機高分子碩士班甲組

第一節 有機化學 試題

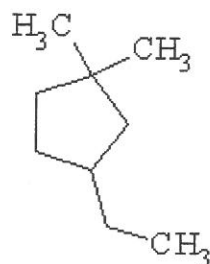
第一頁 共四頁

注意事項：

1. 本試題共兩大題，共 100 分。
2. 不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

Part A (45%) 3 point each

1. Name the following compound.



- A) 3-ethyl-1,1-dimethylcyclopentane  
B) 2,2,4-trimethyl-3-ethylpentane  
C) decane  
D) 1,2-tetramethylpentane  
E) 3-ethyl-1,1-dimethylcyclopentane
2. Name the compound  $\text{CH}_3\text{C}(\text{CH}_3)_2\text{CH}_2\text{CH}_3$ .
- A) 2-isopropylpropane  
B) 1-methyl-2-propylethane  
C) 2,2-dimethylbutane  
D) 1,1-dimethylbutane  
E) hexane
3. Name the compound  $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}(\text{CH}_2\text{CH}_3)\text{C}(\text{CH}_3)_3$ .
- A) 2,4,4-trimethyl-3-ethylpentane  
B) 2,2,4-trimethyl-3-ethylpentane  
C) decane  
D) 1,2-tetramethylpentane  
E) 2,2-dimethyl-3-ethyl-4-methylpentane

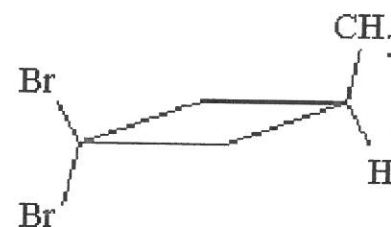
4. Which of the following is optically active?

- A)  $\text{NH}_2\text{CH}(\text{CH}_3)\text{COOH}$   
B)  $(\text{CH}_3)_2\text{C}(\text{NH}_2)\text{COOH}$   
C)  $\text{CH}_3\text{CHCH}(\text{Cl})$   
D)  $\text{C}(\text{CH}_3)_4$   
E)  $\text{NH}_2\text{CH}_2\text{COOH}$

5. Which of the following compounds has a chiral center?

- A)  $\text{CH}_3\text{CH}_2\text{CH}(\text{NH}_2)\text{COOH}$   
B)  $(\text{CH}_3)_2\text{C}(\text{NH}_2)\text{COOH}$   
C)  $\text{CH}_3\text{CHCH}(\text{Cl})$   
D)  $\text{NH}_2\text{CH}_2\text{COOH}$   
E)  $\text{C}(\text{CH}_3)_4$

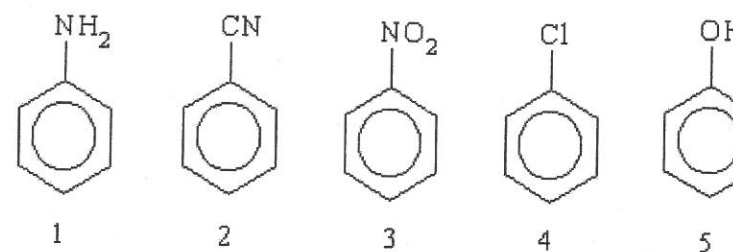
6. Consider the compound below.



Which of the following is true?

- A) The compound has geometric isomers.  
B) The compound is not chiral.  
C) The compound exists as 3 stereoisomers.  
D) The compound is chiral and does not have geometric isomers.  
E) The compound is chiral.

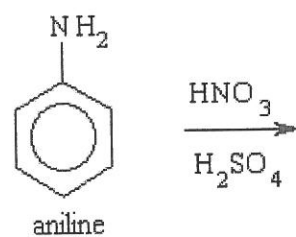
7. Which of the following undergo nitration more slowly than benzene?



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

注意：背面尚有試題

8. What major product(s) is (are) obtained from the following reaction?



- A) *ortho*-nitroaniline and *para*-nitroaniline
- B) *para*-nitroaniline
- C) *meta*-nitroaniline
- D) *ortho*-, *meta*-, and *para*-nitroaniline
- E) *ortho*-nitroaniline

9. What major product(s) is (are) predicted from the following reaction?

- A) None, the ring is deactivated and no reaction occurs.
- B) 2,4-dibromonitrobenzene
- C) 3,4-dibromonitrobenzene
- D) 1,4-dibromobenzene
- E) 1,2,3-tribromonitrobenzene

10. For the compounds below, which statement is true?



- A) Compound 1 is chiral.
- B) Compound 2 is chiral.
- C) Compounds 1 and 2 are chiral.
- D) Compounds 1 and 2 are identical.

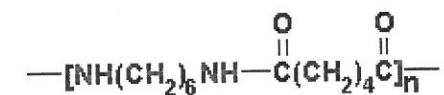
11. A mixture of nitric acid and concentrated sulfuric acid is used to convert benzene to nitrobenzene. The nitrating agent in this reaction is

- A)  $\text{HNO}_3$
- B)  $\text{NO}_2^-$
- C)  $\text{NO}_2^+$
- D)  $\text{NO}_3^-$

12. Which of the following undergoes electrophilic reactions?

- A) ethanol
- B) butane
- C) 2-propene
- D) chloroethane

13. The following polymer is called

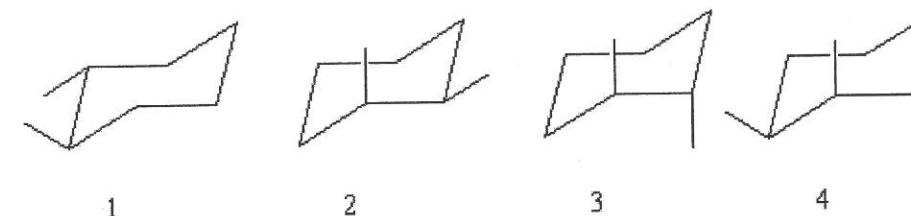


- A) polyester.
- B) Dacron.
- C) Teflon.
- D) kevlar.
- E) nylon-66.

14. Condensation polymerization involves the use of

- A) one or two monomers, each with a nitrile group.
- B) one or two monomers with reactive groups at each end of the molecules.
- C) a monomer with a double bond.
- D) a monomer with a triple bond.
- E) one or two monomers, each with one reactive group.

15. Which of the following have a *trans* configuration?



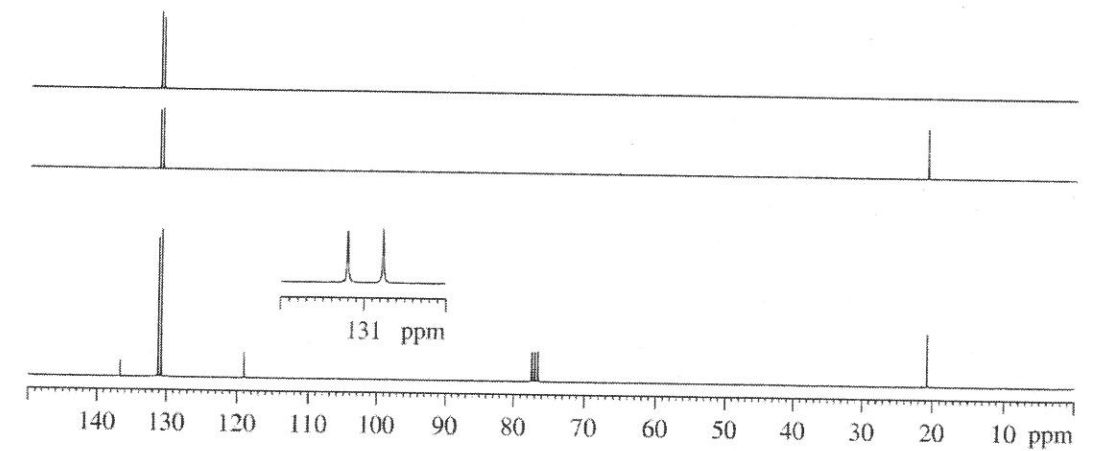
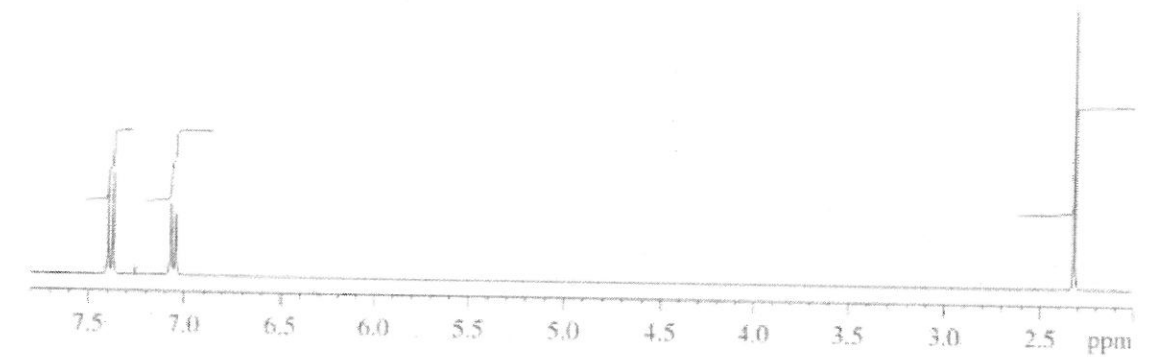
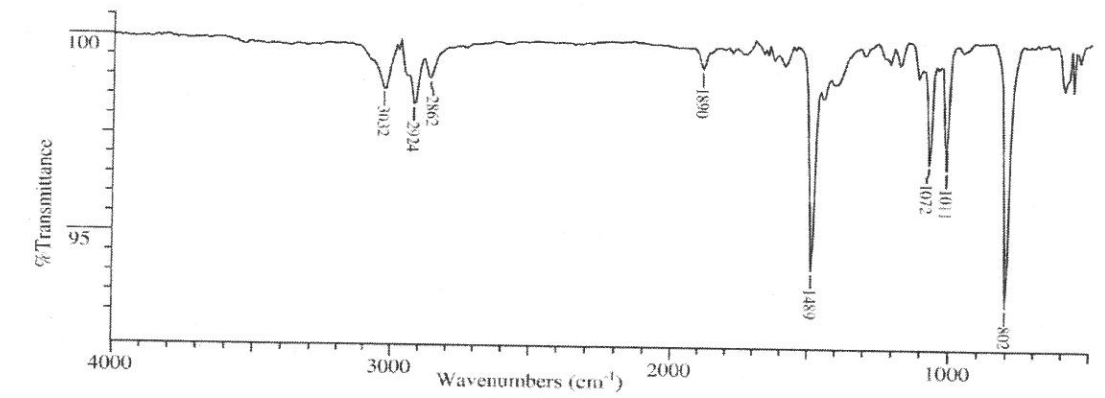
- A) 1, 3, and 4
- B) 3
- C) 1, 2, and 3
- D) 1 and 3
- E) 1, 2, 3, and 4

Part B. (55%) I: 10 point; II, III, IV: 15 point each

- I. Draw the potential energy diagram that represents an exothermic reaction between a tertiary alkyl halide and methanol. Briefly explain your rationale.

II. Draw structures for all possible ethers having the formula  $C_4H_{10}O$

- III. An unknown compound, **C**, has the formula  $C_7H_7Br$ . Elucidate the structure of **C** by scrutinizing its IR,  $^1H$  NMR and  $^{13}C$  NMR spectra, shown below.



IV. An unknown compound, **F**, has the formula  $C_3H_6O_2$ . Elucidate the structure of **F** by scrutinizing its IR,  $^1H$  NMR and  $^{13}C$  NMR spectra, shown below.

