

# 國立成功大學

## 112學年度碩士班招生考試試題

編 號： 275

系 所： 臨床藥學與藥物科技研究所

科 目： 有機化學

日 期： 0207

節 次： 第 1 節

備 註： 不可使用計算機

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

**1. Multiple-Choice Questions (each 2%, total 10 %)**

(1) A carbon-hydrogen bond in ethane ( $\text{CH}_3\text{CH}_3$ ) is best described a \_\_\_\_\_.

- A) highly polar
- B) essentially nonpolar
- C) ionic
- D) a multiple bond
- E) resonance stabilized

(2) How many carbon-carbon  $\sigma$  bonds are present in the molecule shown?



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

(3) If an acyclic alkane hydrocarbon contains  $n$  carbon atoms, how many hydrogen atoms must it also contain?

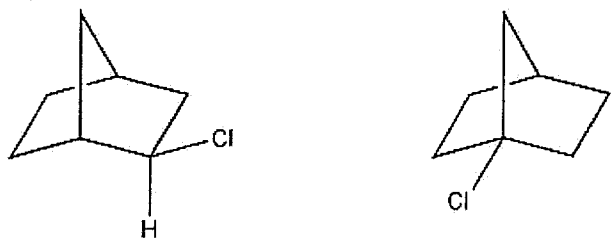
- A)  $n$
- B)  $2n$
- C)  $n + 2$
- D)  $2n + 2$
- E)  $n - 2$

(4) For the compound below, the number of  $1^\circ$ ,  $2^\circ$  and  $3^\circ$  hydrogens, respectively is \_\_\_\_\_.



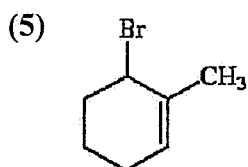
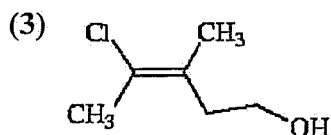
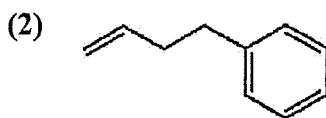
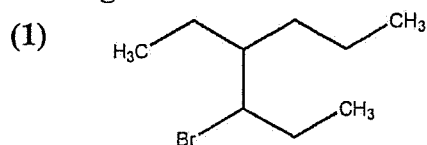
- A) 1, 3, and 1
- B) 3, 6 and 2
- C) 3, 6 and 1
- D) 1, 6 and 0

(5) What is the structural relationship between the two molecule shown below?

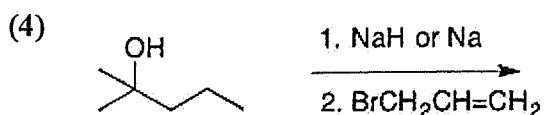
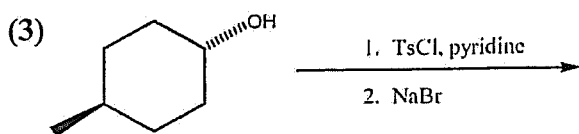
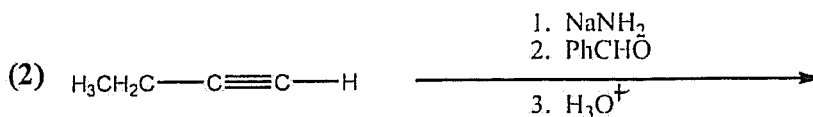
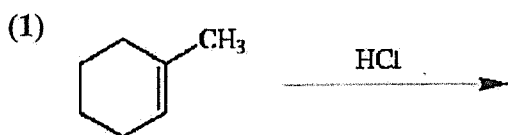


- A) constitutional isomers
- B) enantiomers
- C) diastereomers
- D) conformational isomers
- E) not isomers

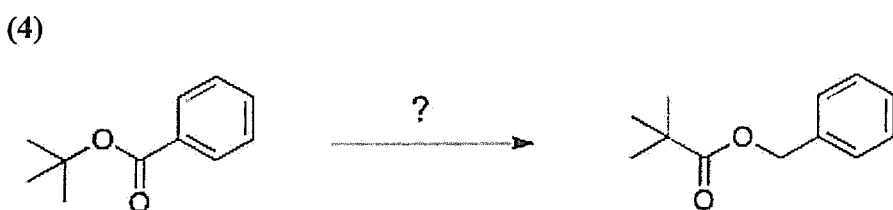
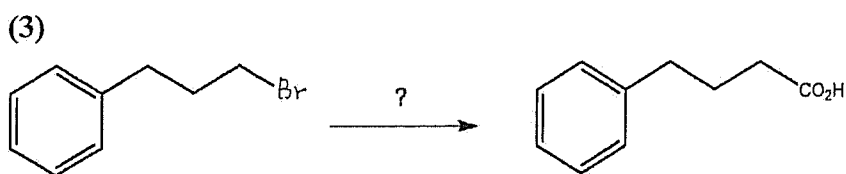
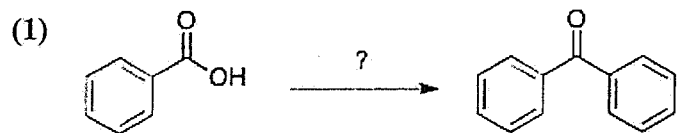
2. Assign the IUPAC names for the following compounds. (each 2%, total 10 %)



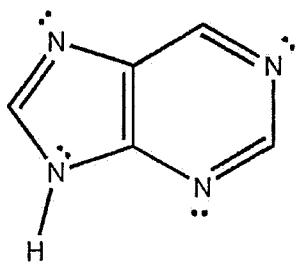
3. Complete the following reactions. (each 2%, total 10%)



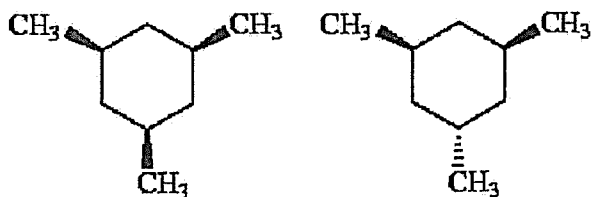
4. Complete the following multiple-step transformation. (each 5%, total 20%)



5. Classify the compound below as aromatic, antiaromatic, or nonaromatic. Assume planarity of the  $\pi$  network. (5%)

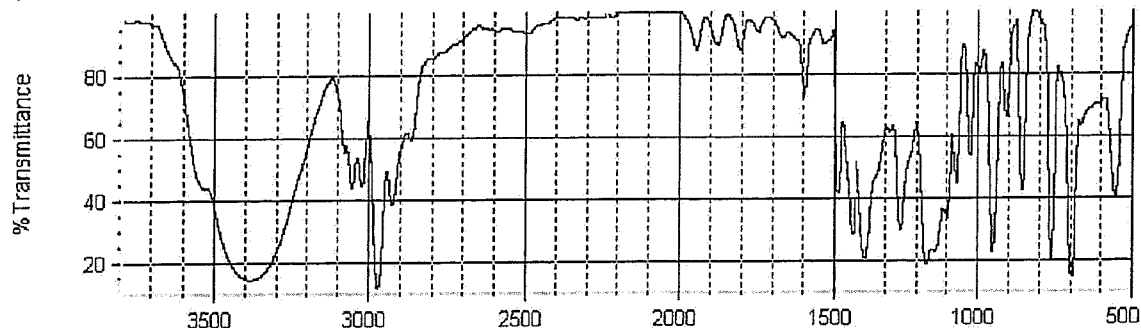


6. How might the two trimethylcyclohexane isomers shown below be most readily distinguished using NMR? (5%)



7. Which of the following structures is consistent with the IR spectra shown below? Assign the peaks. (5%)

(5%)



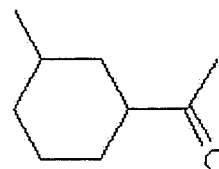
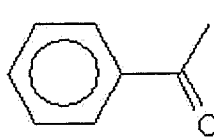
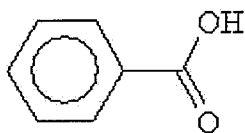
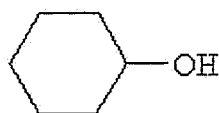
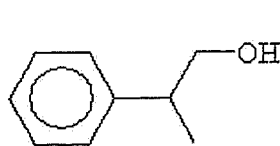
A)

B)

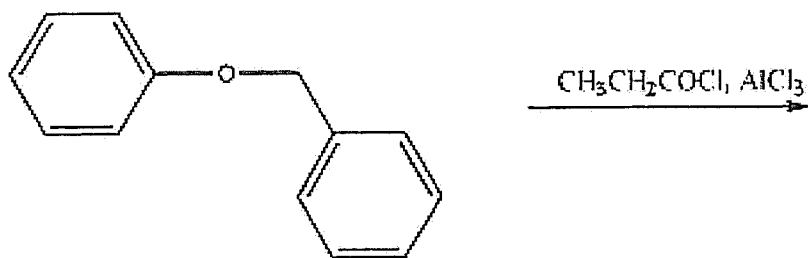
C)

D)

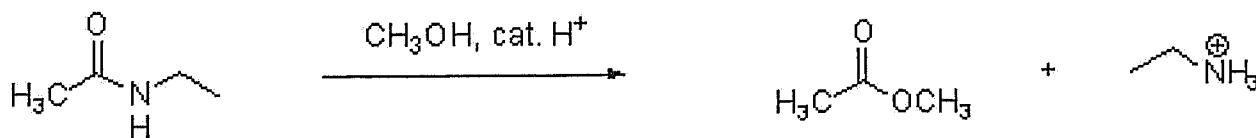
E)



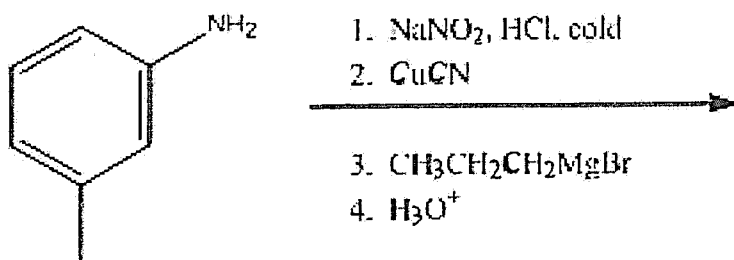
8. Provide the major organic product(s) of the reaction shown below (5%).



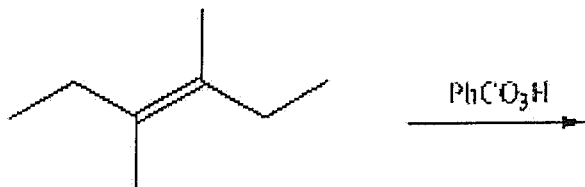
9. Provide an arrow pushing mechanism for the following reaction. Show all intermediate structures and formal charges. You do not need to show resonance structures. (5%)



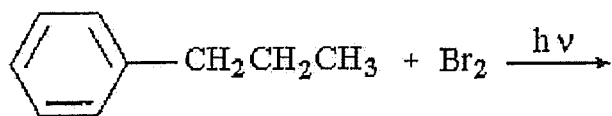
10. Provide the organic product step by step in the reaction below. (5%)



11. Provide the major organic product of the reaction below. (5%)



12. Predict the major monobromination product in the following reaction. (5%)



13. Provide a structure that is consistent with the data below. (5%)

$\text{C}_7\text{H}_{14}\text{O}_2$

IR ( $\text{cm}^{-1}$ ): 2950, 1740

$^1\text{H}$  NMR (d): 2.3 (2H, q), 1.0 (3H, t), 0.9 (9H, s)

$^{13}\text{C}$  NMR (d): 185 (s), 78 (s), 29 (t), 14 (q), 12 (q)

14. Draw a mechanism and provide the structure of the aldol product that results when 4-methylpentanal is heated with sodium hydroxide. (5%)