

國立成功大學
110學年度碩士班招生考試試題

編 號：45

系 所：化學系

科 目：有機化學

日 期：0203

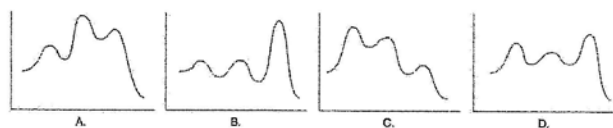
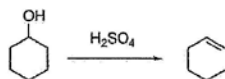
節 次：第 2 節

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。

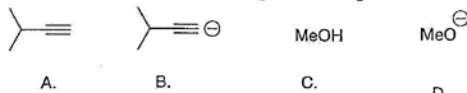
Part I. Multiple choice (one answer only, 30%)

1. Which of the following is the energy diagram for the following reaction?



- A). A B). B C). C D). D E). none of these

2. Which of the following is the strongest nucleophile?

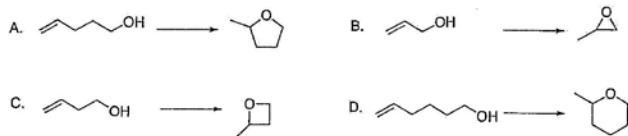


- A). A B). B C). C D). D E). can not compare

3. What set of reaction conditions would favor an $\text{S}_{\text{N}}2$ reaction on 2-bromo-3-methylbutane?

- A). weak nucleophile in a protic solvent
 B). weak nucleophile in an aprotic solvent
 C). strong nucleophile in a protic solvent
 D). strong nucleophile in an aprotic solvent
 E). none of these

4. Which of the following would you expect to have the most negative ΔS ?

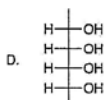
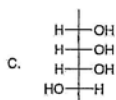
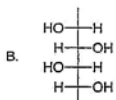
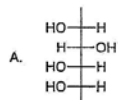


- A). A B). B C). C D). D E). can not compare

5. What is the percentage of the *R* enantiomer in a sample of carvone that has a specific rotation of -20 , given that the specific rotation of (*R*)-carvone is -61 ?

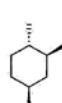
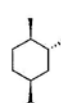
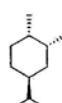
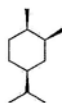
- A). 20% B). 66.5% C). 33.5% D). 61% E). 55%

6. Which of the following is a correct Fischer projection of the following compound?



- A). A B). B C). C D). D E). none of these

7. Which of the following is the most stable isomer?

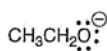


- A). A B). B C). C D). D E). can not compare

8. Which of the following solvents can be used with $(\text{CH}_3)_3\text{CLi}$?

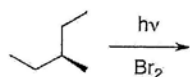
- A). $\text{CH}_3\text{CH}_2\text{OH}$ B). CH_3OH C). H_2O
 D). Liquid NH_3 E). $\text{CH}_3(\text{CH}_2)_4\text{CH}_3$

9. Rank the following bases in order of *decreasing* basicity.



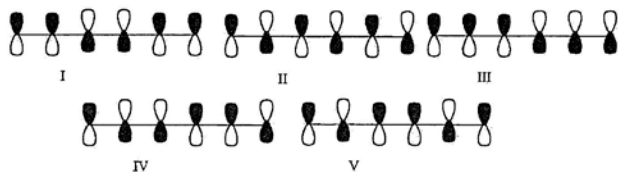
- A). III > I > V > II > IV B). III > V > IV > I > II
 C). V > I > III > II > IV D). III > IV > II > V > I
 E). IV > II > I > III > V

10. Which of the following is the correct name for the major product of the following reaction?



- A). (2*S*, 3*R*)-1,2-dibromo-3-methylpentane
 B). (*S*)-2-bromo-3-methylpentane
 C). (*R*)-2-bromo-3-methylpentane
 D). (*S*)-1-bromo-3-methylpentane
 E). 3-bromo-3-methylpentane

11. Which one of the following represents the LUMO of 1,3,5-hexatriene?



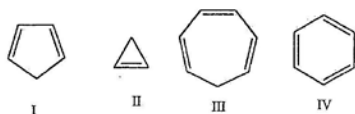
- A). I B). II C). III D). IV E). V

12. Which of the following best describes the stereochemistry of ring closure and the product for the following reaction?



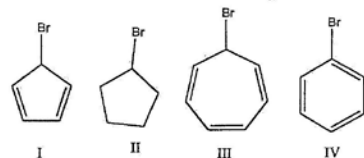
- A). isotatory, *cis*-3,4-diethylcyclobutene
 B). conrotatory, *cis*-3,4-diethylcyclobutene
 C). disrotatory, *trans*-3,4-diethylcyclobutene
 D). conrotatory, *trans*-3,4-diethylcyclobutene
 E). none of the above

13. Which one of the following compounds is most acidic?



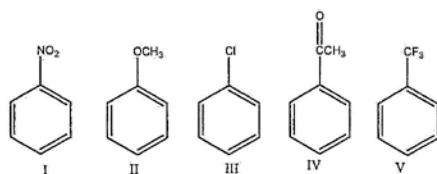
- A). I B). II C). III D). IV E). can not compare

14. Which one of the following compounds will undergo the fastest S_N1 reaction?



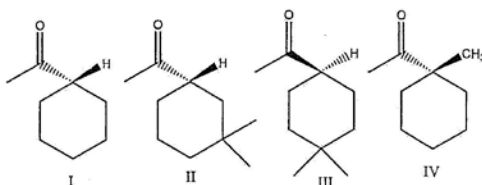
- A). I B). II C). III D). IV E). I and III

15. Which one of the following compounds would be least reactive toward electrophilic aromatic substitution?



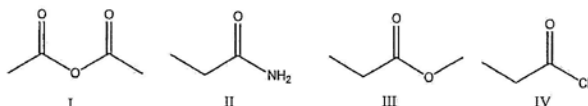
- A). I B). II C). III D). IV E). IV and V

16. Which of the following compounds would undergo racemization in presence of a base?



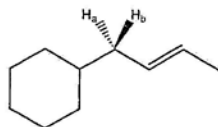
- A). I B). II C). III D). IV E). II and III

17. Rank the following carboxylic acid derivatives in decreasing order (most to least) of reactivity towards nucleophilic substitution.



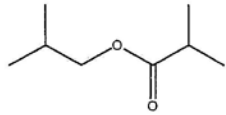
- A). I>IV>III>II B). II>III>IV>I C). I>III>II>IV
 D). III>IV>II>I E). IV>I>III>II

18. Protons H_a and H_b in the following compound are _____.



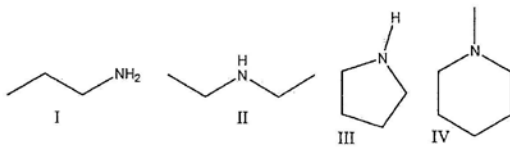
- A). Homotopic B). Enantiotopic C). Diastereotopic
 D). Mesotopic E). none of these

19. How many signals would you expect to find in the ^1H NMR spectrum of the following compound?



- A). 4 B). 5 C). 6 D). 7 E). 8

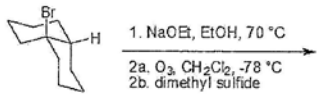
20. Which of the following amines will form an enamine with aldehydes and ketones?



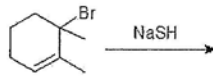
- A). I B). II C). III D). IV E). II and III

Part II. Provide the (major) product for each of the following reactions. Be showing the stereochemistry if it does have (36%)

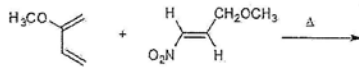
1.



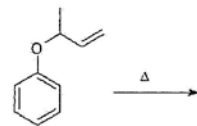
2.



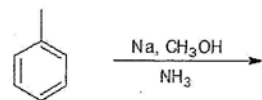
3.



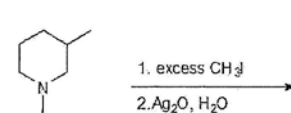
4.



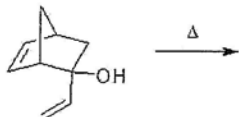
5.



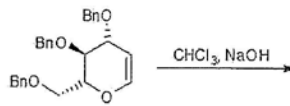
6.

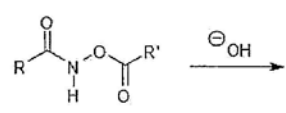


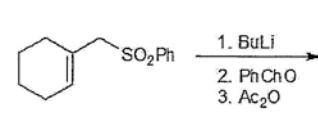
7.

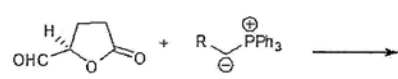


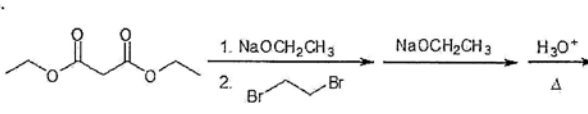
8.



9.  $\xrightarrow{\ominus\text{OH}}$

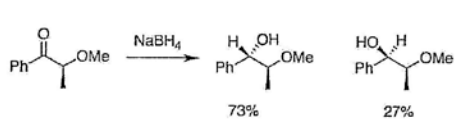
10.  $\xrightarrow{\begin{matrix} 1. \text{BuLi} \\ 2. \text{PhCHO} \\ 3. \text{Ac}_2\text{O} \end{matrix}}$

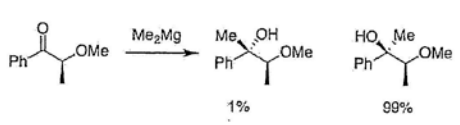
11. 

12. 

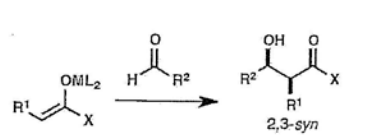
Part III. Please answer the following questions. (34%)

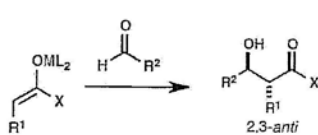
1. Following nucleophilic addition of carbonyl compound was carried out with different nucleophile. It was observed the results are quite different in yield. Explain these observed results. (7%)





2. It was observed that aldol reaction involving enolates having the 'trans' arrangement prefer to form anti-products, while enolates having 'cis'-arrangement give mainly cis-products such as shown in the followings. Explain these observed results. Note: using the different chair-like transition states. (7%)



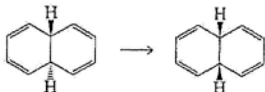


X = OR, SR, alkyl
M = Li, B, Ti, Sn, etc.

3. Provide stepwise synthesis for the following (6%)



4. How can this transformation be carried out using only heat or light? (6%)



5. Identify the compound with molecular formula $C_9H_{10}O$ that gives the IR and 1H NMR spectra shown below. Account for your answer. (8%)

