國立成功大學

112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：0207

節　次：第 2 節

備　註：不可使用計算機

編號： 45

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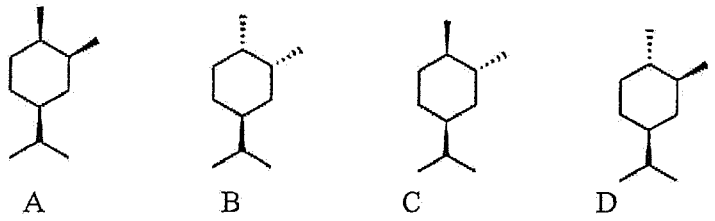
※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

PART I. Mutiple Choice (40%, 2% each)

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

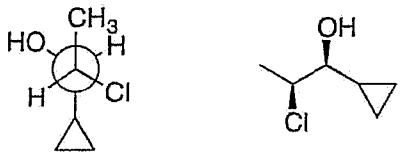


A). A　　B) B　　C). C　　D). D　　E). C & D

2. What is the specific rotation of pure (*S*)-carvone if a sample of (*R*)-carvone of 85% ee has a specific rotation of -54?

A). -61　　B). 64　　C). 0　　D). 61　　E). -64

3. Identify the relationship between these two structures.

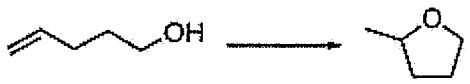


A). Diastereomers　　B). Enantiomers　　C). The same compound

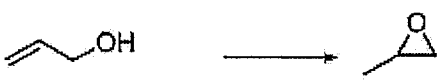
D). Unrelated compounds　　E). Structural isomer

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

A.

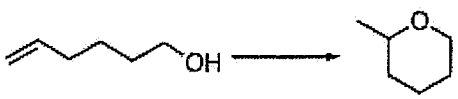


B.



C.

D.



A). A　　B), B　　C). C　　D). D　　E). all are positive ΔS

5. Which of the following statements regarding nucleophilic substitutions is wrong?

A). Protic solvents stabilize cations and anions.

B). Polar aprotic solvents stabilize cations, but not anions.

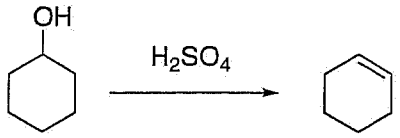
C). Protic solvents favor S_N1 by stabilizing polar intermediates and transition states.

D). Polar aprotic solvents favor S_N2 by lowering the energy of transition state.

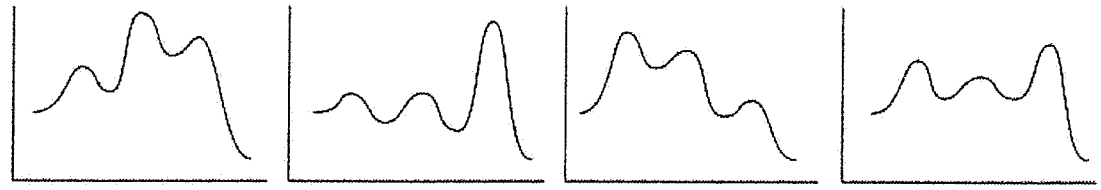
E). none of these is wrong.

6. Which one of the following is a major product in a Claisen condensation?
A). ∝-keto ester B). β-keto ester ~ C). β-hydroxy ester
D). γ-hydroxyester E). β-diketone

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



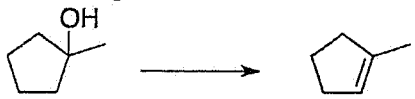
A B C D



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

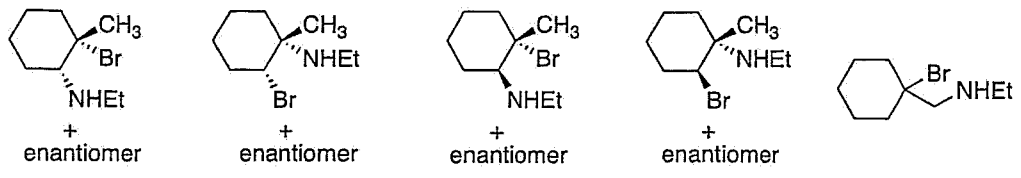
8. In a reaction where addition and elimination reactions are in equilibrium, which of the following statements is most correct?
A). Addition and elimination reactions are favored at low temperatures.
B). Addition and elimination reactions are favored at high temperatures.
C). Only addition reactions are favored at low temperatures.
D). Only elimination reactions are favored at low temperatures.
E). Addition and elimination reactions are disfavored at low temperatures.

9. What would be the optimal conditions to effect the following transformation?



A). Dilute H_2SO_4 B). Concentrated H_2SO_4 C). Dilute HBr
D). Concentrated HBr E). none of these

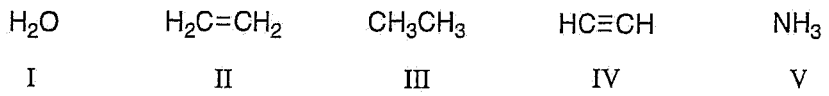
10. The reaction of Br_2 with 1-methylcyclohexene, in the presence of ethylamine ($EtNH_2$), is expected to produce which of the following as the *major* product?



I II III IV V

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

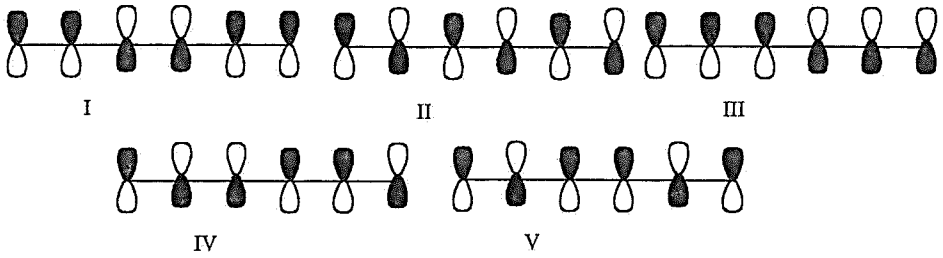
11. Rank the following acids in order of *decreasing* acidity.



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

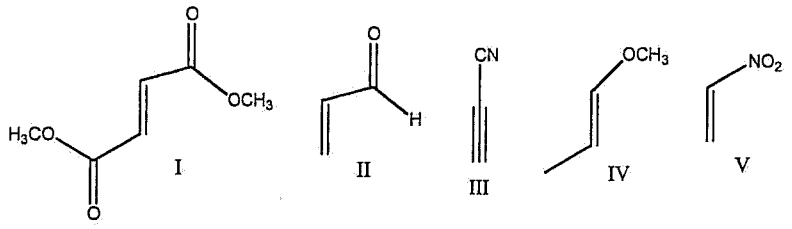
12. Both *s-cis* and *s-trans* conformers of 1,3-butadiene have a continuous conjugated π system. Which of the following statements is true about the *s-cis* conformer?
A). The *s-cis* conformer is lower in energy than the *s-trans* conformer
B). The *s-cis* conformer is higher in energy than the *s-trans* conformer
C). The *s-cis* conformer has equal energy as the *s-trans* conformer
D). The ^{1}H-NMR of the *s-cis* conformer is same as that of the *s-trans* conformer
E). none of these

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



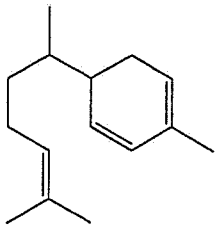
A). I　B). II　C). III　D). IV　E). V

14. Which one of the following dienophiles is least reactive in the Diels-Alder reaction?



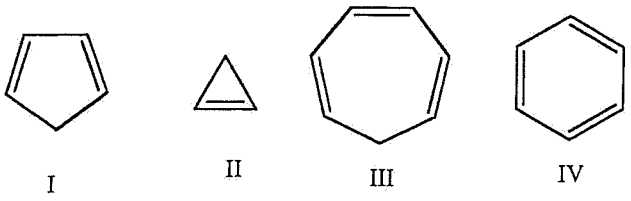
A). I　B). II　C). III　D). IV　E). V

15. Use Woodward-Fieser rules to estimate the λ_{max} for the following compound.



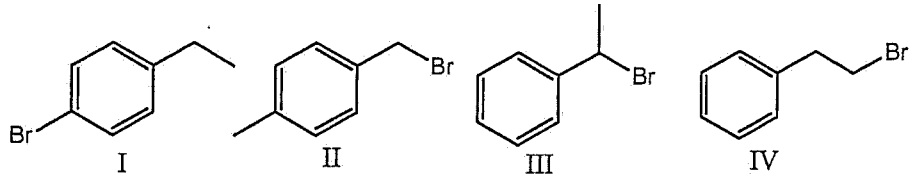
A). 271 nm　B). 266 nm　C). 276 nm　D). 286 nm　E).273 nm

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



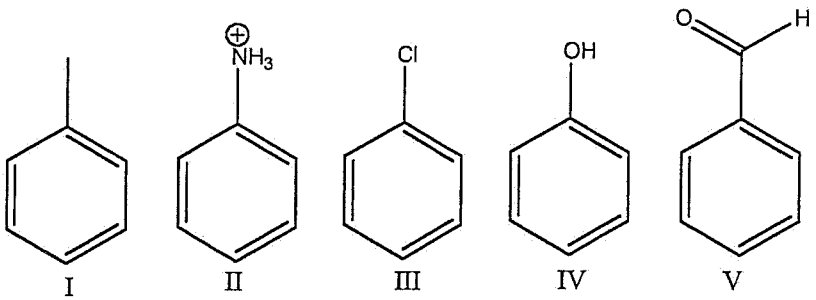
A). I　B). II　C). III　D). IV　E). I and III

17. Which of the following structures with molecular formula C_8H_9Br, is consistent with the following ^1H NMR spectrum as following.
^1H NMR: 2.8δ (triplet, I=2H), 4.65δ (triplet, I=2H), 7.2δ (multiplet, I=5H)



A). I　B). II　C). III　D). IV　D). none of these

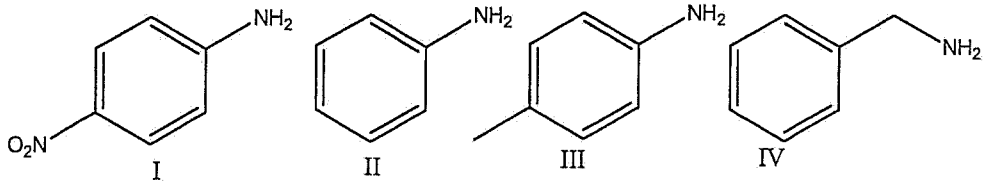
18. Arrange the following compounds in order of decreasing reactivity towards electrophilic aromatic substitution:



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

19. Which of the following criteria is necessary for a nucleophilic aromatic substitution reaction?
A). the ring must conatin a very strong electron withdrawing group
B). the ring must contain a leaving group
C). the leaving droup must be *ortho* or *para* to the electron withdrawing group
D). the leaving droup must be *meta* to the electron withdrawing group
E). A, B & C

20. Rank the following compounds in decreasing (strongest to weakest) order of basicity.



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

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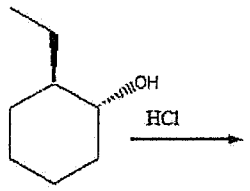
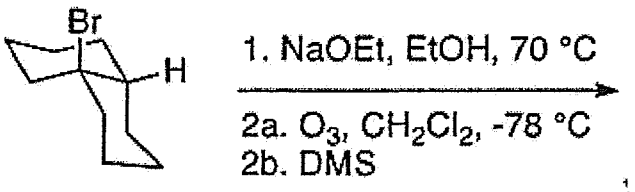
PART II Predict the product for each of the following reactions. (30%, 3% each)

1.



2.



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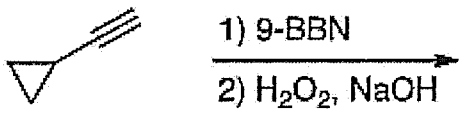

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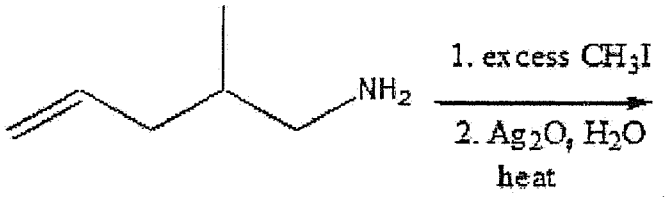
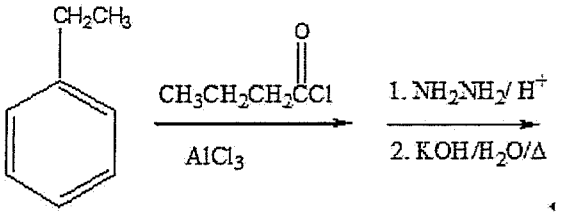
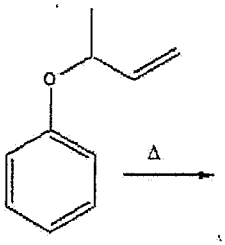


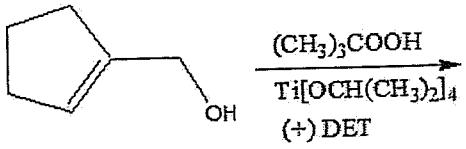
5.



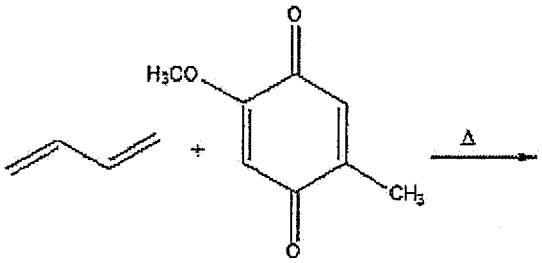
6.



7.

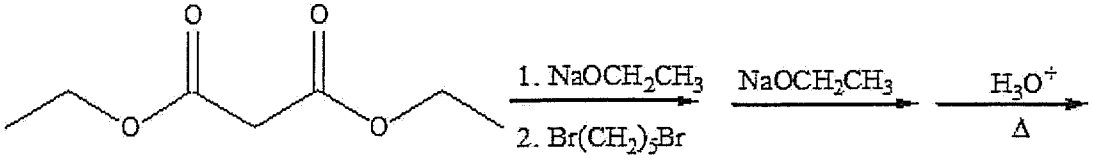


8.



9.

10.



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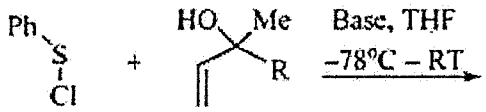
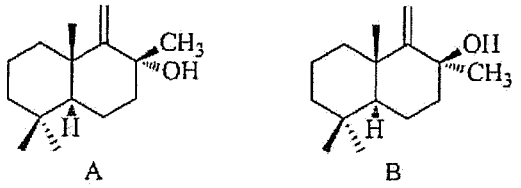
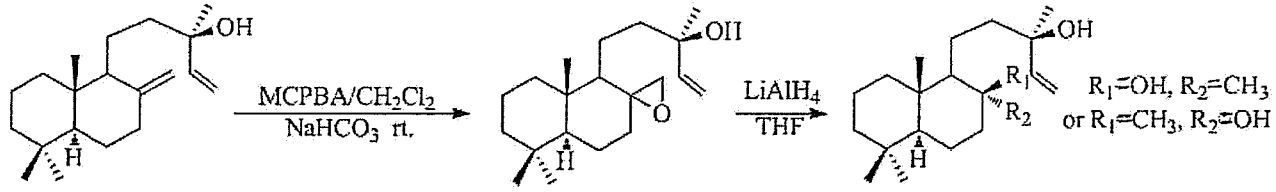
PART III. Please answer the following questions. (30%)

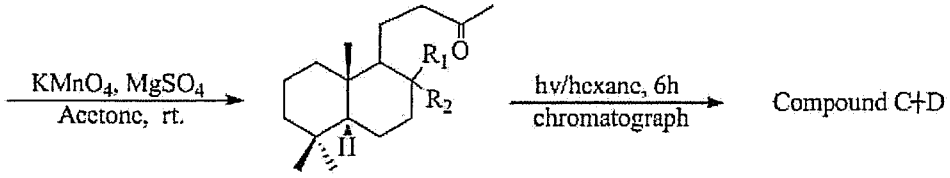
1. Give the product for the following reaction and show a mechanism to explain your answer. (7%)



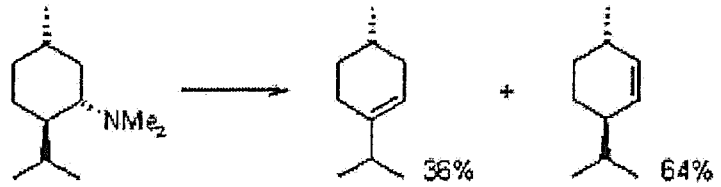
2. The following two compounds, A and B, are natural product and the structures were assigned based on the spectroscopic data, but the absolute configurations were not determined yet. In order to determine the configurations, an organic chemist did some organic reaction from an already known structure as a template to get two compounds (C and D) as shown in the following reaction scheme. Compound C and D show the same spectroscopic data (MS and NMR) as that of compound A and B, respectively, but with opposite optical rotation. What are the correct structures of A and B and show the absolute configuration for each stereogenic center of compound A. (7%)

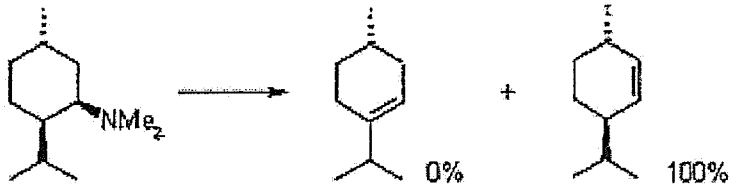






3. The following reactions were carried out by reacting with meta-chloroperbenzoic acid followed by heating. Please explain the following observations. (8%)





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4. A compound with molecular formula $C_8H_{11}N$ displays the following IR, ^1H NMR and ^{13}C NMR spectra. Propose a structure for this compound and account for your answer. (8%)