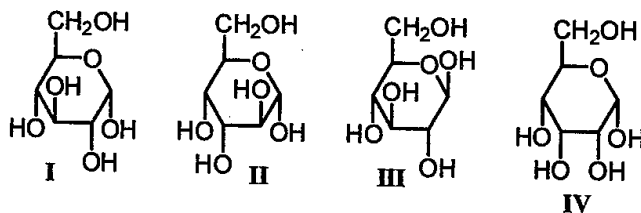


注意：本試題包含單選題及問答題兩部份

Part I. 單選題 (25 題, 75 分) ※ 注意：選擇題請於答案卷之「選擇題作答區」依序作答。

1. Which are the anomers?

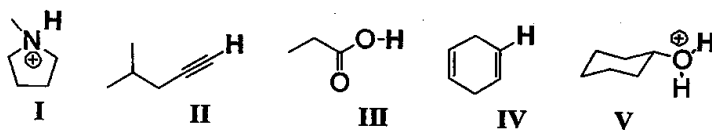


- (A) I and II      (B) I and III      (C) II and III      (D) II and IV      (E) III and IV

2. Which of these compounds would have the highest boiling point?

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

3. Rank the **bold-faced** hydrogens for the following compounds from most acidic to least acidic.



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

4. How is it possible to differentiate compounds in a racemic mixture?

- (A) by distilling of one isomer from the other      (B) how the mixture rotates in plane polarized light  
(C) through the use of IR spectroscopy      (D) chemical conversion to a diastereomeric mixture  
(E) it is impossible to differentiate the two compounds

5. Which of these combinations is **not** one which would result in the formation of essentially one Claisen condensation product when one compound is added slowly to the mixture of the other and the base employed?

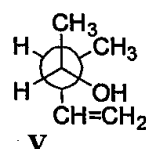
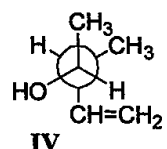
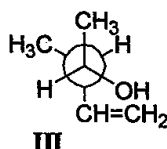
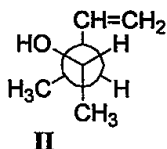
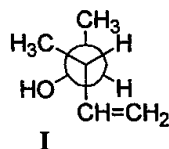
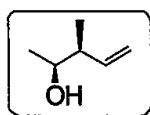
- (A)  $\text{HCO}_2\text{Et} + \text{CH}_3\text{CH}_2\text{CO}_2\text{Et}$       (B)  $\text{PhCO}_2\text{Et} + \text{CH}_3\text{CO}_2\text{Et}$   
(C)  $(\text{CO}_2\text{Et})_2 + \text{PhCH}_2\text{CO}_2\text{Et}$       (D)  $(\text{CH}_3)_3\text{CCO}_2\text{Et} + \text{CH}_3\text{CO}_2\text{Et}$   
(E)  $\text{PhCH}_2\text{CO}_2\text{Et} + \text{CH}_3\text{CO}_2\text{Et}$

6. What is the index of hydrogen deficiency of a compound with the molecular formula of  $\text{C}_9\text{H}_{18}\text{N}_2$ ?

- (A) 2      (B) 3      (C) 4      (D) 5      (E) 6

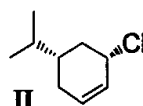
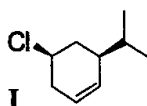
7. Which staggered Newman projection(s), looking down the C-2—C-3 bond (C-2 in front and C-3 in back), illustrates the following boxed compound?

見背面



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

8. I and II are:



- (A) enantiomers.    (B) diastereomers.    (C) constitutional isomers.  
(D) identical.    (E) not isomeric.

9. The relative nucleophilicities of species do not necessarily parallel the relative basicities of the same species because

- (A) not all nucleophiles are bases, and vice versa.  
(B) experimental measurements of sufficient accuracy are not available to make the comparisons.  
(C) nucleophilicity is a thermodynamic matter; basicity is a matter of kinetics.  
(D) basicity is a thermodynamic matter; nucleophilicity is a matter of kinetics.  
(E) Actually, the relative values do parallel one another.

10. Which classification best describes the mechanism of the synthesis of polyamides via step growth polymerization?

- (A) nucleophilic acyl addition    (B) nucleophilic acyl substitution    (C) electrophilic addition  
(D) radical substitution    (E) elimination

11. A true statement about the transition state(s) of an  $S_N2$  reaction is:

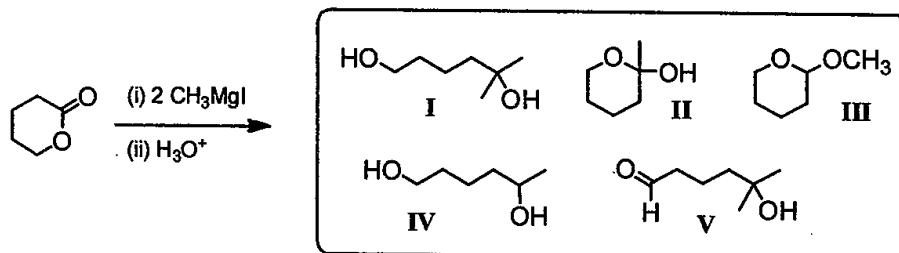
- (A) The two transition states are of unequal energy.  
(B) The transition states precede and follow an unstable reaction intermediate.  
(C) The single transition state represents the point of maximum free energy of the reaction.  
(D) Existence of this transition state implies an exothermic reaction.  
(E) The transition state will always have a net charge of -1.

12. Cyclohexene reacts with bromine to yield 1,2-dibromocyclohexane. Molecules of the product would:

- (A) be a racemic form and, in their most stable conformation, they would have both bromine atoms equatorial.  
(B) be a racemic form and, in their most stable conformation, they would have one bromine atom equatorial and one axial.  
(C) be a meso compound and, in its most stable conformation, it would have both bromine atoms equatorial.  
(D) be a meso compound and, in its most stable conformation, it would have one bromine atom equatorial and one axial.  
(E) be a pair of diastereomers and, in their most stable conformation, one would have the bromines equatorial

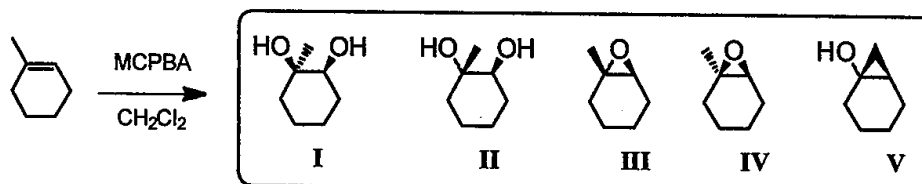
and axial, and the other would have the bromines equatorial and equatorial.

13. Which product is formed from the following transformation:



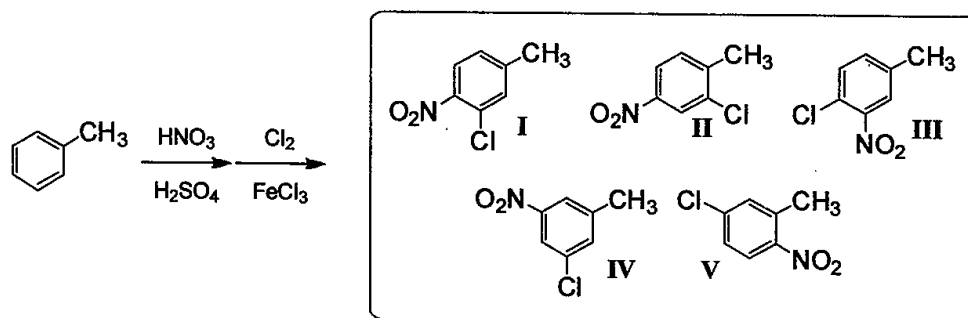
- (A) I                      (B) II                      (C) III                      (D) IV                      (E) V

14. Which is the major product of the following reaction?



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

15. Which is the major product of the following reaction?



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

16. Which solvents are polar aprotic? (I) DMSO, (II) H<sub>2</sub>O, (III) acetone, (IV) formic acid.

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

17. What is the major product from an elimination reaction starting with 2-bromopentane?

- (A) 1-pentene                      (B) *trans*-2-pentene                      (C) *cis*-2-pentene  
(D) 2-bromopentene              (E) none of the above.

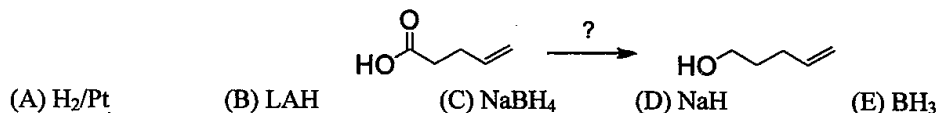
18. Rearrangements are likely to occur in which of the following reaction types?

- (A) S<sub>N</sub>1 reactions              (B) S<sub>N</sub>2 reactions              (C) E1 reactions

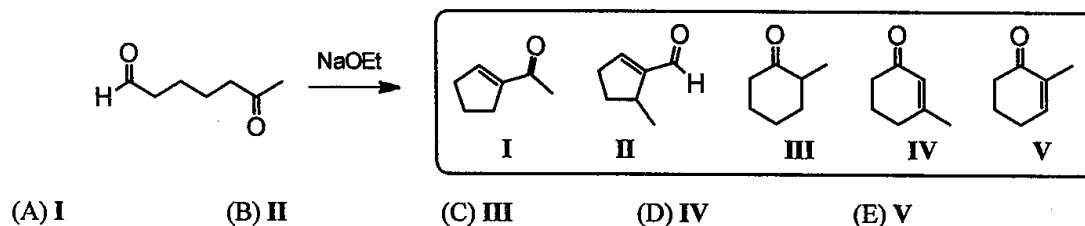
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- (D) E2 reactions (E) Both  $S_N1$  and E1 reactions

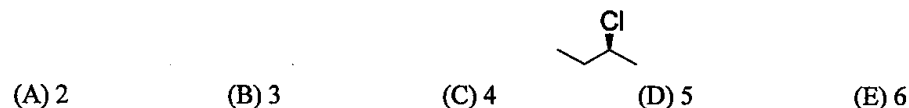
19. What is the best choice of reagent to perform the following transformation?



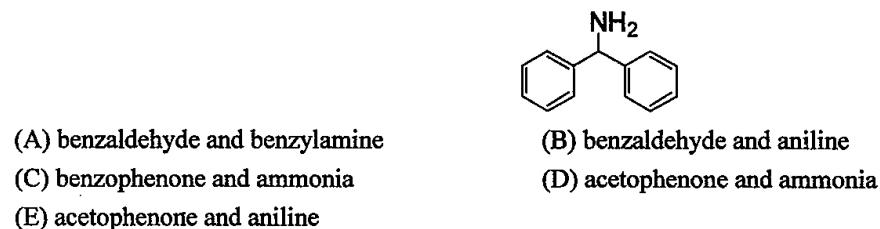
20. Which is the major product of the following reaction?



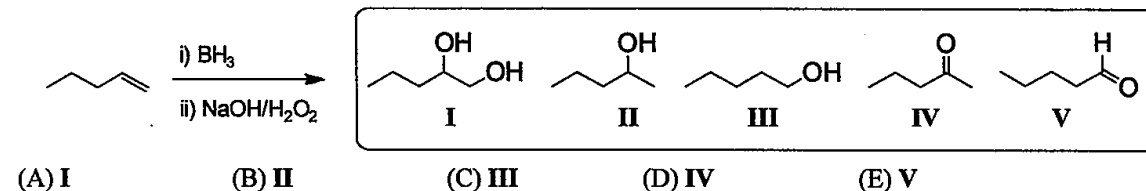
21. How many sets of signals are there in the  $^1H$ -NMR spectrum for the following compound?



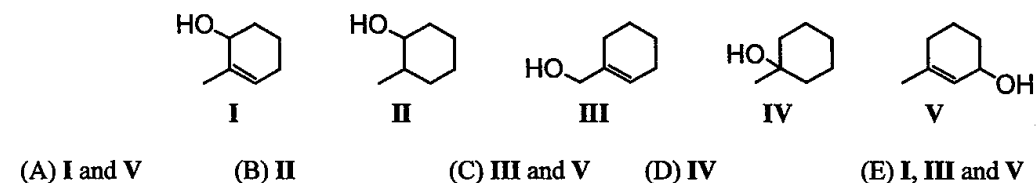
22. The following product can be made from the reductive amination of which combination of compounds?



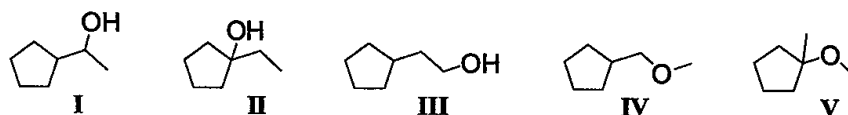
23. Which is the major product of the following reaction?



24. Treating 1-methylcyclohexene with  $H_3O^+$  would yield primarily which of these?



25. A Grignard reagent is prepared by reacting cyclopentanol with first  $\text{SOCl}_2$  and then magnesium in ether. The Grignard reagent is then reacted with acetaldehyde and the reaction mixture acidified. What is the major final product of this series of reactions?

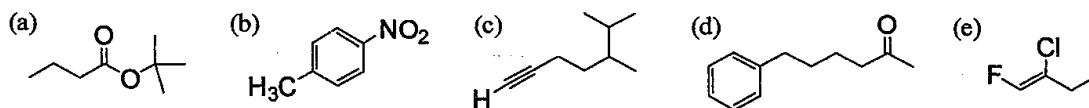


- (A) I                      (B) II                      (C) III                      (D) IV                      (E) V

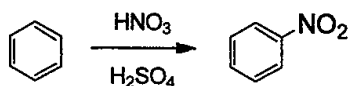
※ 注意：請於試卷上「非選擇題作答區」標明題號並依序作答。

Part II. 問答題 (3 題, 25 分)

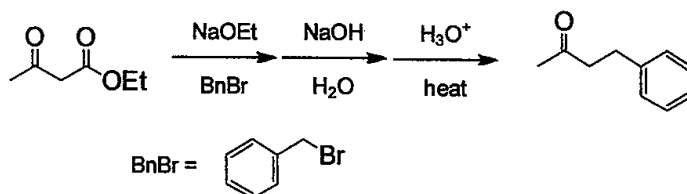
1. Please name the following compounds (in English). (10 points)



2. Give a detailed reaction mechanism for the following reactions. (7 points)



3. Give a detailed reaction mechanism for the following reactions. (8 points)



試題隨卷繳回