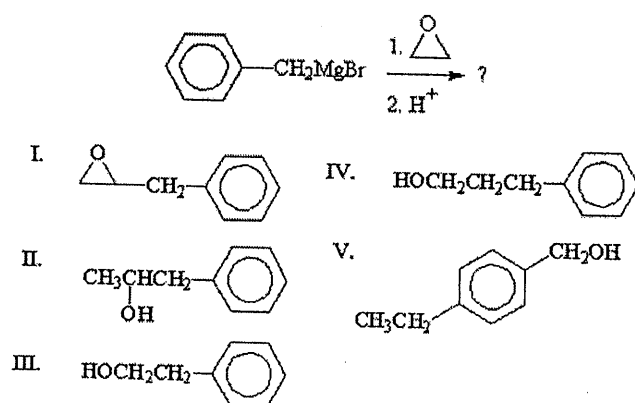


類組：化學類 科目：有機化學(1002)

※請在答案卡內作答

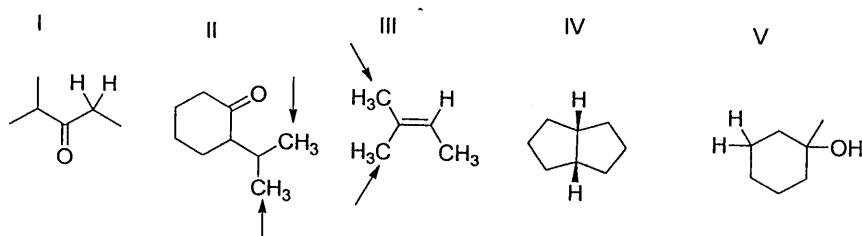
單選題，共 40 題，每題 2.5 分，請在答案卡上作答。

1. What is the product of the following reaction?



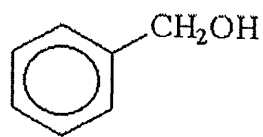
- (A) I  
(B) II  
(C) III  
(D) IV  
(E) V

2. Identify the indicated sets of protons as diastereotopic



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

3. Which of the following m/z values is the base peak for benzyl alcohol?



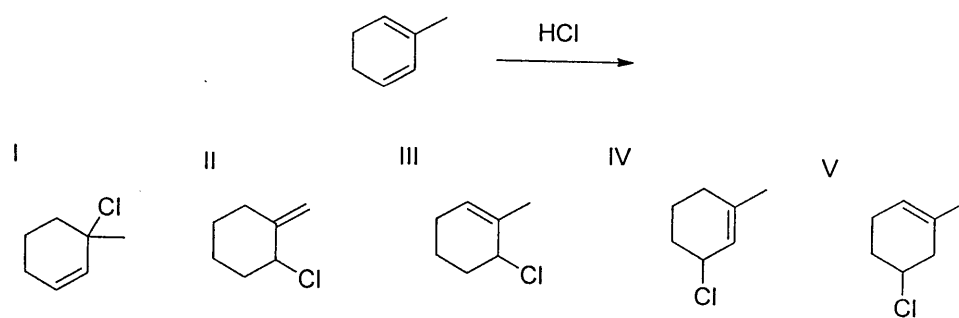
- (A) 77  
(B) 108  
(C) 91  
(D) 17  
(E) 52

4. What are the structures of the likely products from reaction of 1 equivalent of HCl with 2-methyl-1,3-cyclohexadiene?

注意：背面有試題

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※請在答案卡內作答

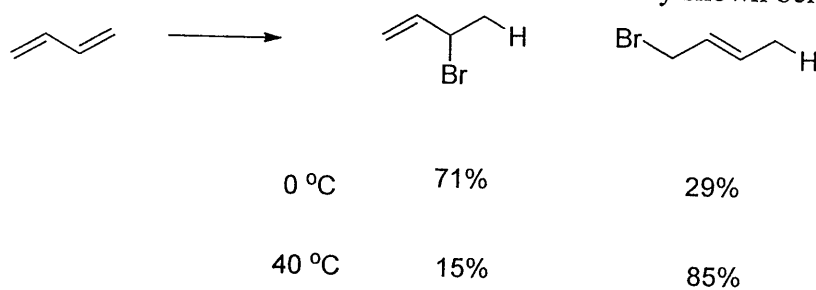


- (A) I, II, III  
 (B) I, III, IV  
 (C) I, II, IV  
 (D) III, IV, V  
 (E) all of them

5. Which of the following species has a characteristic absorption at  $3300\text{ cm}^{-1}$  in its IR spectrum?

- (A)  $(\text{CH}_3)_2\text{CHCCH}$   
 (B)  $(\text{CH}_3)_2\text{CHN}(\text{CH}_3)_2$   
 (C)  $(\text{CH}_3)_2\text{CHCCCH}_3$   
 (D)  $(\text{CH}_3)_2\text{CHCH}=\text{CH}_2$   
 (E)  $(\text{CH}_3)_2\text{CHCO}_2\text{CH}_3$

6. Which of the following statements for the 1,3-butadiene chemistry shown below is true?



- (A) 1,2-Addition product is the kinetic control product  
 (B) 1,2-Addition and 1,4-addition products can be easily distinguished by  $^{13}\text{C}$  NMR  
 (C) Allylic carbonanion is the intermediate  
 (D) At  $0\text{ }^\circ\text{C}$ , the reaction is in equilibrium  
 (E) 1,2-Addition product is the more stable product

7. Which of the following is the best method for preparing  $\text{CH}_3\text{Br}$ ?

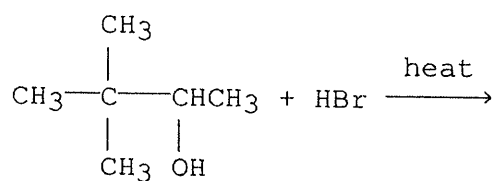
- (A)  $\text{CH}_3\text{OH} + \text{Br}^-$   
 (B)  $\text{CH}_3\text{OH} + \text{HBr}$   
 (C)  $\text{CH}_3\text{OH} + \text{Br}_2$   
 (D)  $\text{CH}_3\text{OH} + \text{NaBr}$   
 (E)  $\text{CH}_3\text{OH} + \text{Br}^+$

8. What is the major product of the following reaction?

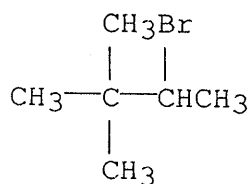
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類組：化學類 科目：有機化學(1002)

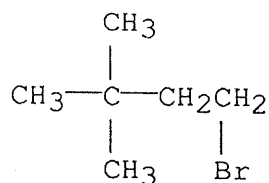
※請在答案卡內作答



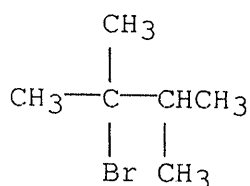
(A)



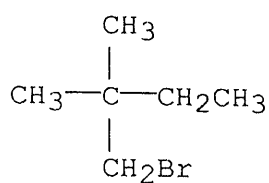
(B)



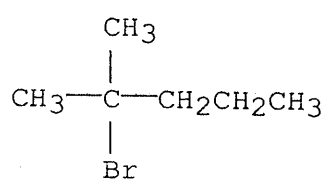
(C)



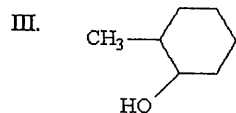
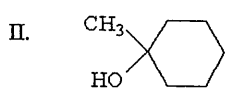
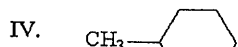
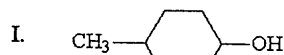
(D)



(E)



9. Which of the following alcohols dehydrates with the *fastest* rate?



(A) I

(B) II

(C) III

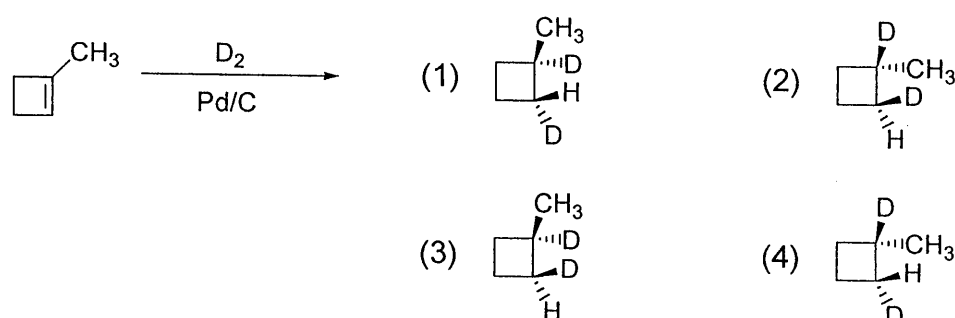
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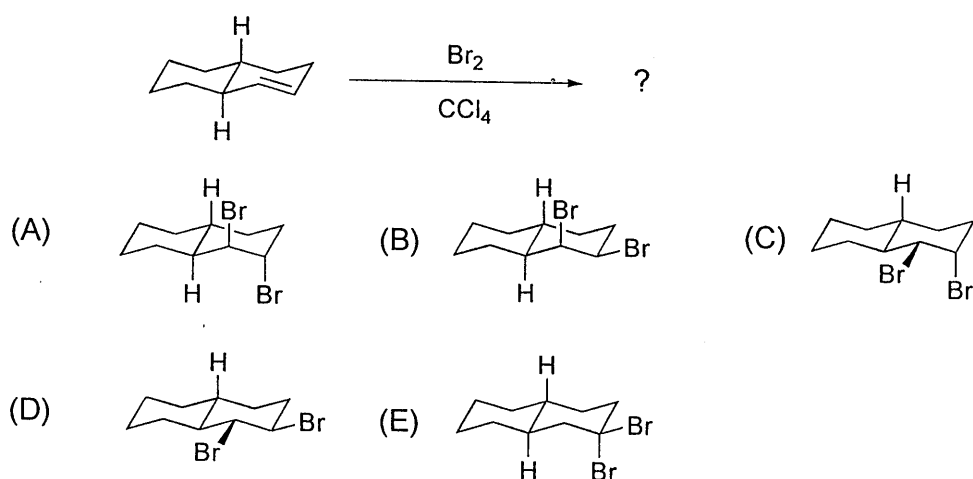
- (D) IV  
(E) V

10. Deuterium (ie.,  $^2\text{H}_2$  or  $\text{D}_2$ ) undergo the same type of reactions as does hydrogen. Which products result from the following reaction?



- (A) mostly a 50 : 50 mixture of (1) and (2)  
(B) mostly a 50 : 50 mixture of (1) and (3)  
(C) mostly a 50 : 50 mixture of (2) and (3)  
(D) mostly a 50 : 50 mixture of (3) and (4)  
(E) mostly a 50 : 50 mixture of (2) and (4)

11. Which is the major organic product from the reaction?



12. Which of the following does not provide evidence that there are two different mechanisms for nucleophilic substitution?
- (A) Reaction products when  $\text{CH}_3\text{I}$  is used as the substrate  
(B) Reaction products when  $(\text{CH}_3)_3\text{CCH}_2\text{I}$  is used as substrate  
(C) The stereochemistry of nucleophilic substitutions  
(D) The effect of nucleophile concentration on rate  
(E) The polarity of solvents
13. Which of the following statements concerning  $\text{S}_{\text{N}}2$  reactions of alkyl halides is not correct?
- (A) The rate of reaction depends on the concentration of the nucleophile.  
(B) The rate of reaction depends on the concentration of the alkyl halide.  
(C) The rate of reaction of a particular alkyl bromide depends on the steric accessibility of the

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※請在答案卡內作答

carbon of the C-Br bond.

(D) All alkyl iodides react more rapidly than all alkyl chlorides.

(E) The rate of reaction depends on the relative nucleophilicity of the nucleophile.

14. Which of the following best explains why  $S_N1$  reactions involving a neutral reactant are *faster* in polar solvents?

(A) The substrate is more soluble in polar solvents.

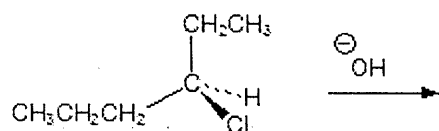
(B) The substrate is less soluble in polar solvents.

(C) The nucleophile is solvated by polar solvents.

(D) Solvation by polar solvents stabilizes the carbocation.

(E) Solvation by polar solvents stabilizes the transition state.

15. Give the name of the product for the following  $S_N2$  reaction.



(A) (*S*)-2-hexanol

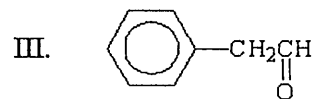
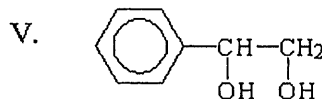
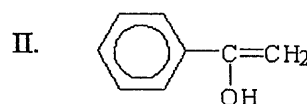
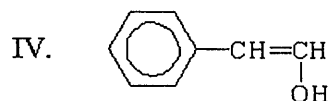
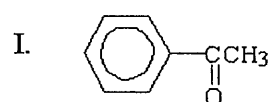
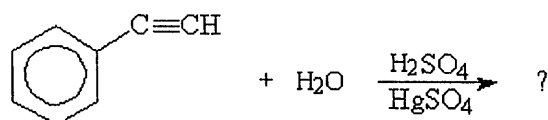
(B) (*R*)-2-hexanol

(C) (*S*)-3-hexanol

(D) (*R*)-3-hexanol

(E) 2-hexene

16. Which of the following is the final and major product of this reaction?



(A) I

(B) II

(C) III

(D) IV

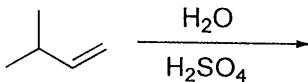
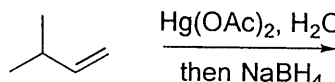
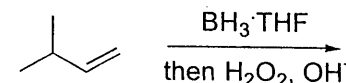
(E) V

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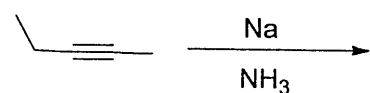
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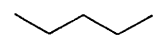
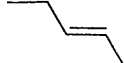
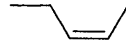


※請在答案卡內作答

17. Which of the following reaction would produce 3-methyl-1-butanol in the best yield?

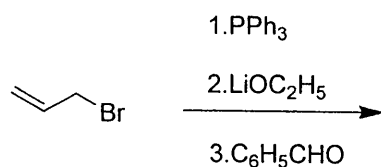
- (A)  (B) 
- (C)  (D) All of the above work equally well
- (E) None of the reaction condition above

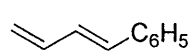
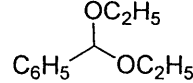
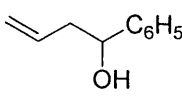
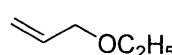
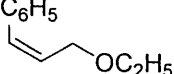
18. Give the major organic product for the reaction.



- (A)  (B)  (C)  (D)  (E) 

19. What is the product of the following reaction sequence?

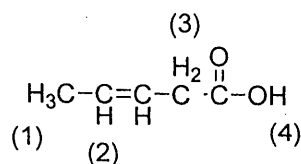


- (A)  (B)  (C) 
- (D)  (E) 

20. According to the Hammond Postulate, which of the following is correct?

- (A) The transition state of an endothermic reaction step will be more reactant-like than product-like.  
 (B) The intermediate of an endothermic reaction step will be more reactant-like than product-like.  
 (C) The transition state of an exothermic reaction step will be more reactant-like than product-like.  
 (D) All transition states are more product-like than reactant-like.  
 (E) All transition states are more reactant-like than product-like.

21. What is the order of increasing chemical shift values in the  $^1\text{H-NMR}$  spectrum for the indicated hydrogen atoms (lowest first)?



注意：背面有試題

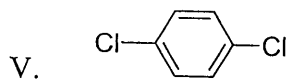
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- (A) 1234
- (B) 1324
- (C) 3124
- (D) 2134
- (E) 4231

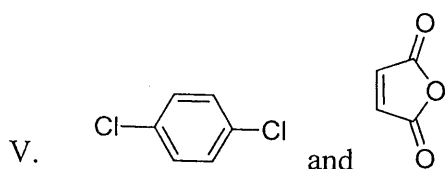
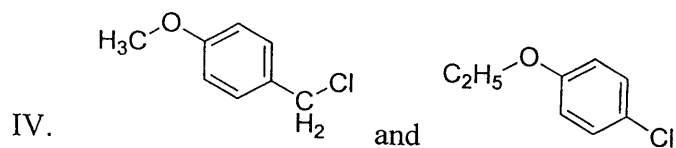
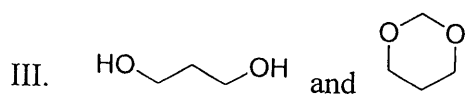
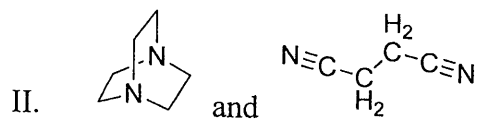
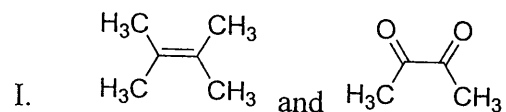
22. Which of the following compounds would be expected to show spin-spin splitting in their  $^1\text{H}$  NMR spectra?

- I.  $(\text{CH}_3)_3\text{C}-\text{O}-\text{CH}_3$
- II.  $\text{Br}-\text{CH}_2\text{CH}_2\text{CH}_2-\text{Br}$
- III.  $(\text{CH}_3)_2\text{CH}-\text{O}-\text{CH}_3$
- IV.  $\text{Br}-\text{CH}_2\text{CH}_2-\text{Br}$



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

23. If you need to distinguish the compounds below, which would you chose IR spectroscopy instead of  $^1\text{H}$ -NMR?



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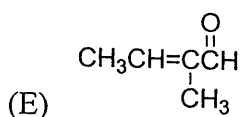
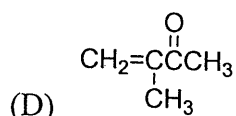
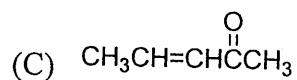
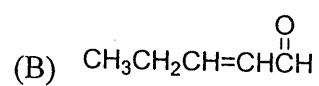
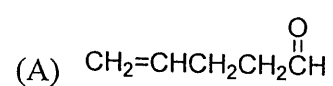
類組：化學類 科目：有機化學(1002)

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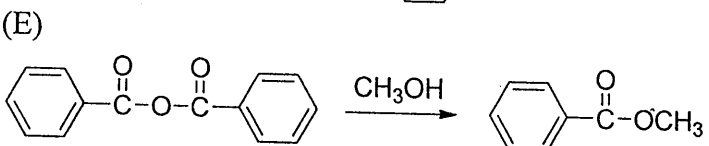
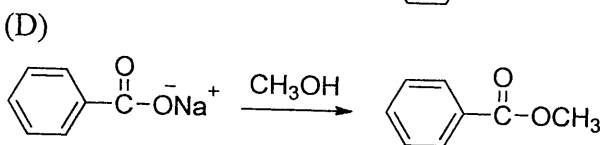
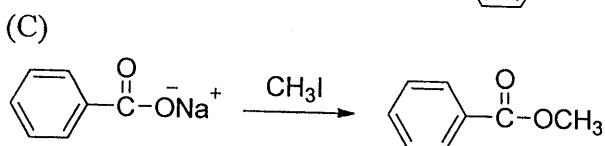
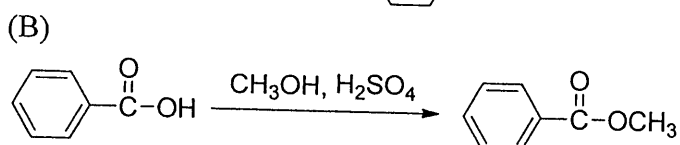
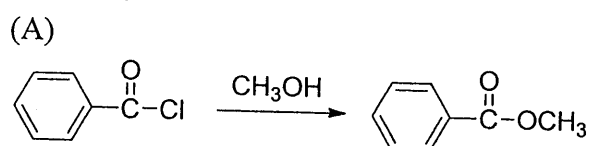
- (A) I, II, III
- (B) II, III, IV
- (C) I, II, III, IV
- (D) I, II, III, V
- (E) III, IV, V

24.  $\delta$  9.5 ppm, singlet, 1 H  
 $\delta$  6.5 ppm, quartet, 1 H  
 $\delta$  2.0 ppm, doublet, 3 H  
 $\delta$  1.8 ppm, singlet, 3 H

Which of the structures below is consistent with the  $^1\text{H}$  NMR data above?



25. Which of the following reaction would *not* be an acceptable method for the preparation of methyl benzoate?



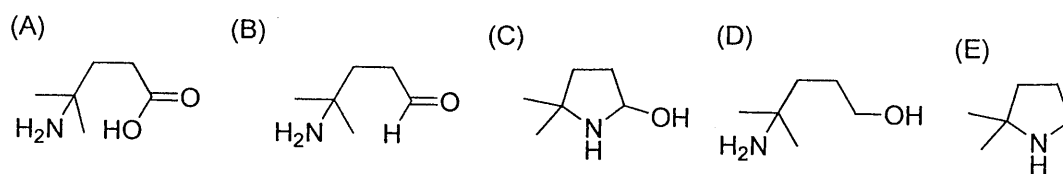
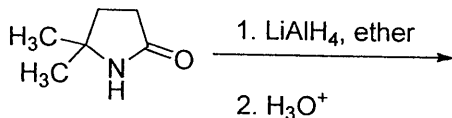
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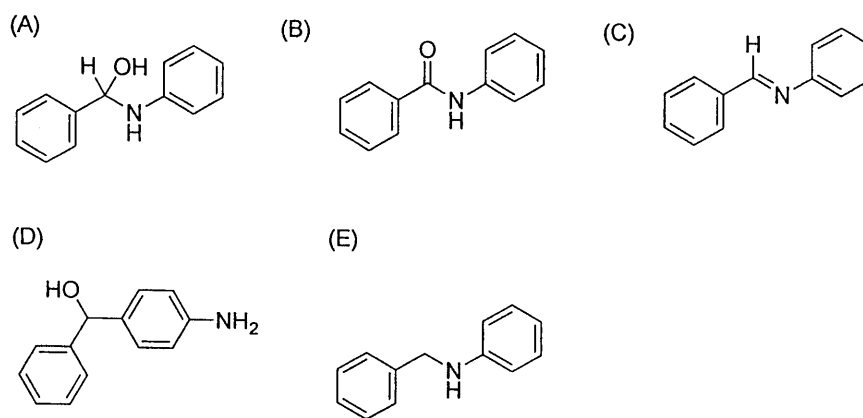
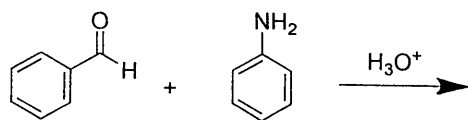
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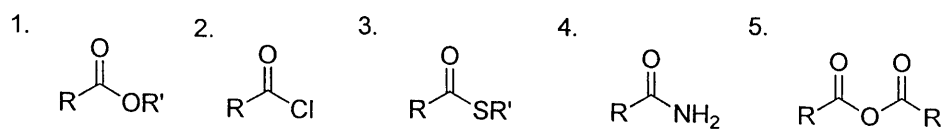
26. What is the major product from the following reaction?



27. Which of the following is expected to be the major product of the reaction shown?



28. What is the order of reactivity toward 1-propanol in Nucleophilic Acyl Substitution (**lowest first**)?



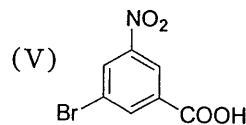
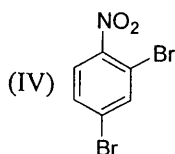
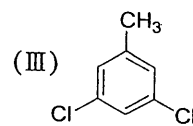
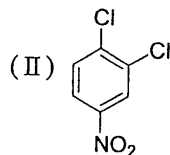
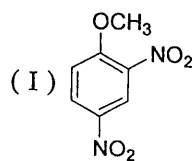
- (A) 25314  
 (B) 45312  
 (C) 41352  
 (D) 54312  
 (E) 43152

29. Which of the following compounds can probably be prepared by direct electrophilic substitution on a disubstituted benzene?

注意：背面有試題

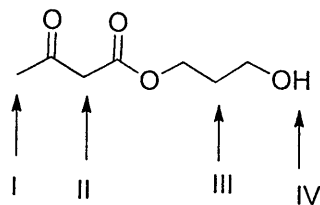
類組：化學類 科目：有機化學(1002)

※請在答案卡內作答



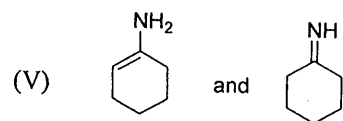
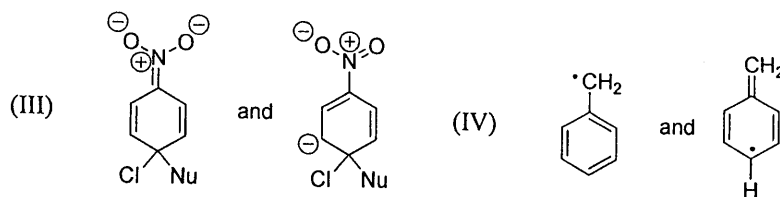
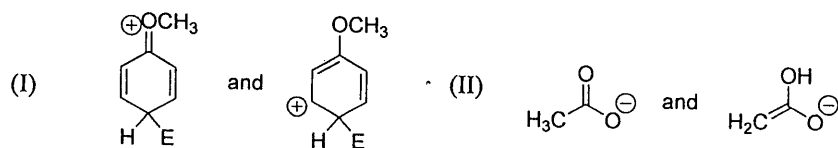
- (A) I, II, III, IV  
 (B) I, II, IV, V  
 (C) I, III, V  
 (D) I, III, IV  
 (E) I, II, III, IV, V

30. Arrange the indicated hydrogen in order of increasing acidity (least acidic first).



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

31. Which of the following pairs is *not* resonance structure?



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

注意：背面有試題

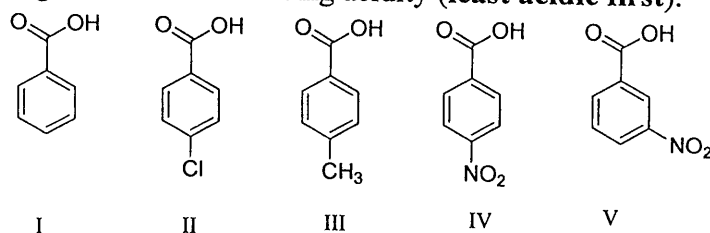
類組：化學類 科目：有機化學(1002)

※請在答案卡內作答

(D) IV, V

(E) II, III

32. Arrange the following in order of increasing acidity (**least acidic first**).



(A) III, I, II, V, IV

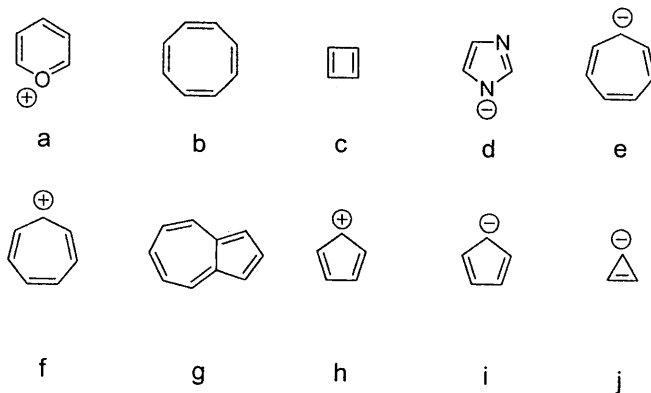
(B) I, II, III, IV, V

(C) I, III, II, V, IV

(D) V, IV, II, I, III

(E) III, I, II, IV, V

33. Which of the following molecules are aromatic compounds?



(A) a, d, e, g, h

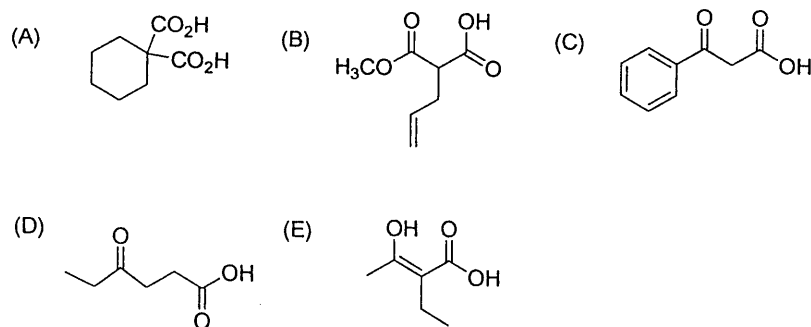
(B) a, b, f, g, i

(C) b, e, h, i, j

(D) b, d, g, i, j

(E) a, d, f, g, i

34. Which of the following would **not** readily undergo decarboxylation when heating under acidic condition?

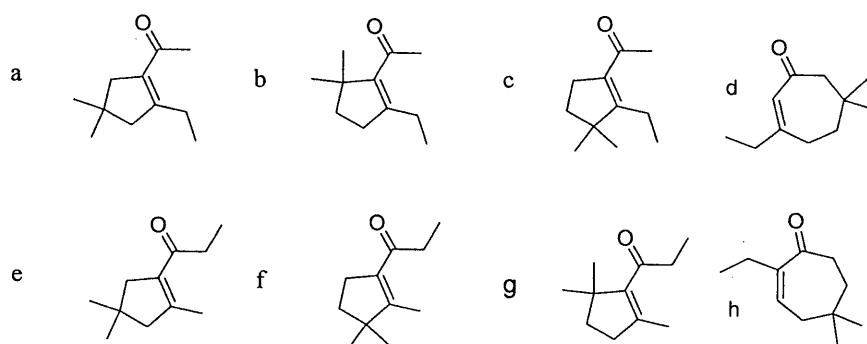
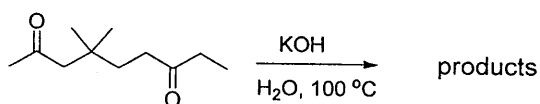


35. Which of the following products can be formed from the reaction below?

注意：背面有試題

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※請在答案卡內作答

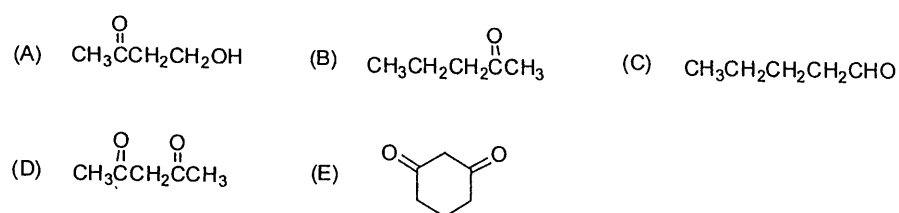


- (A) b, d, e  
 (B) a, f, h  
 (C) c, d, e, h  
 (D) a, d, e  
 (E) b, d, f

36. Who are the Nobel prize winners associated with boron chemistry?

- (I) Ryoji Noyori, (II) Georg Wittig, (III) Herbert Brown, (IV) Elias James Corey, (V) Akira Suzuki  
 (A) I, III  
 (B) III, V  
 (C) II, III  
 (D) II, V  
 (E) III, IV

37. Which of the following compounds has the highest enol content?



38. Which of the following descriptions are **not** true for carbonyl chemistry.

- (I) The side product of Wittig reaction is phosphine oxide.  
 (II) Amides can be formed by reacting carboxylic acids with diazomethane.  
 (III) Wolff-Kishner reduction is carried out under acidic conditions.  
 (IV) Acetals are generally hydrolyzed under acidic conditions and stable under basic conditions.  
 (V) Friedel-Crafts alkylation is limited by multiple substitutions.  
 (A) II, III  
 (B) II, IV  
 (C) I, III  
 (D) IV, V

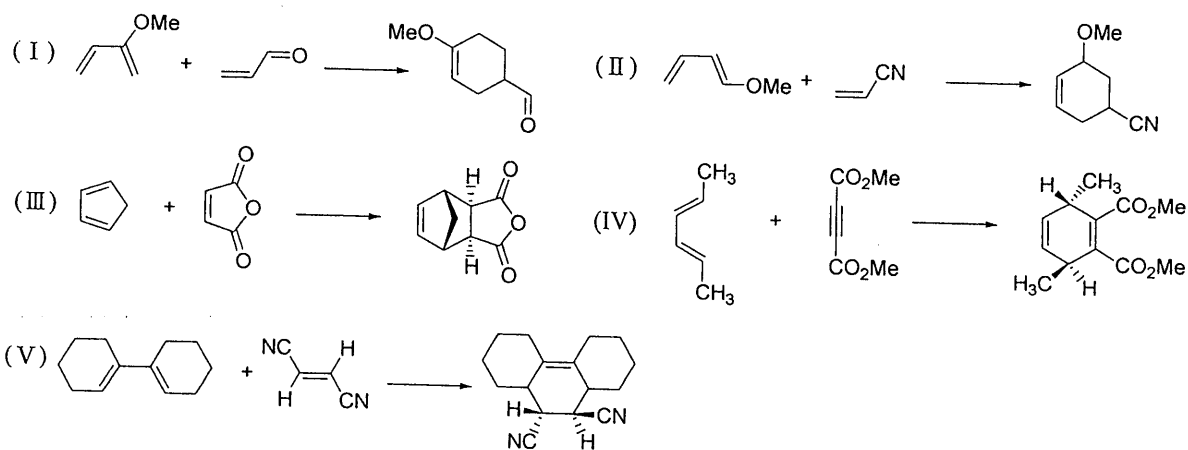
注：背面有試題  
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※請在答案卡內作答

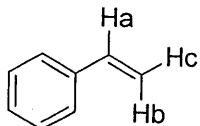
(E) III, IV

39. Which of the following Diels-Alder reactions give the major product with the correct stereochemistry or regioselectivity?



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

40. Which of the following statements for the  $^1\text{H}$  NMR of styrene is *not* true?



- (A) Compare to  $\text{H}_b$  and  $\text{H}_c$ ,  $\text{H}_a$  is the most downfield peak  
 (B)  $\text{H}_a$  is split into a doublet of doublet  
 (C)  $\text{H}_b$  is split into a doublet of doublet  
 (D)  $\text{H}_c$  is split into a triplet  
 (E)  $\text{H}_b$  and  $\text{H}_c$  are diastereotopic