

系所組別： 生物化學暨分子生物學研究所甲、乙組

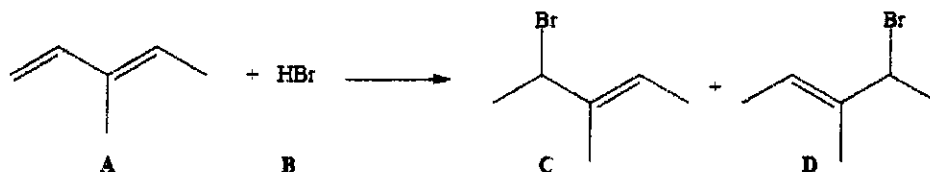
考試科目： 有機化學

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1-45 (2 points for each; wrong answer will deduct 1 point)

1-3. Consider the reaction below to answer the following 1-3 questions.



1. The nucleophile in this reaction is?

A. A	B. B
C. C	D. D
E. None of them	

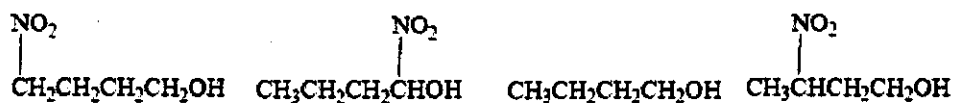
2. The electrophile in this reaction is?

A. A	B. B
C. C	D. D
E. None of them	

3. The product that results from 1,4-addition is?

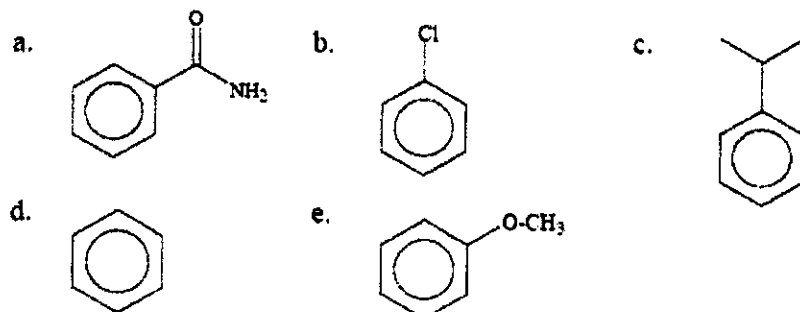
A. A	B. B
C. C	D. D
E. C and D	

4. Rank the following compounds from most (1) to least (4) acidic.



- | | |
|------------|------------|
| A. 1>2>3>4 | B. 3>2>1>4 |
| C. 1>2>4>3 | D. 3>2>4>1 |
| E. 2>4>1>3 | |

5. Which of these gives mostly the meta product when treated with Br₂/Fe?



(背面仍有題目,請繼續作答)

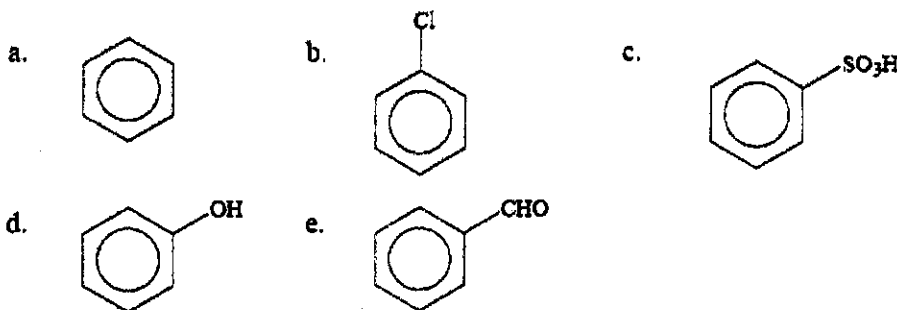
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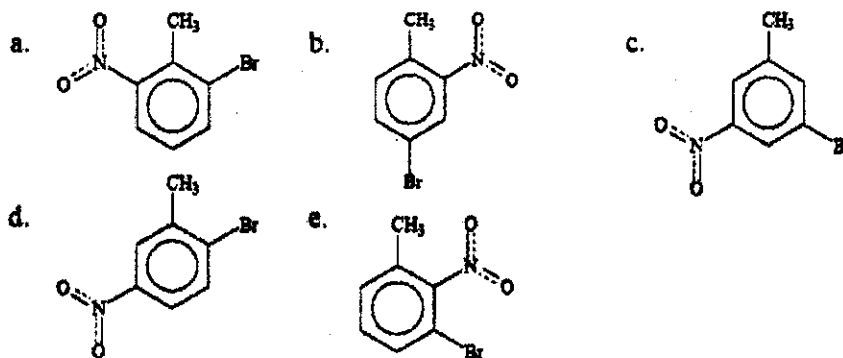
6. Which undergoes electrophilic substitution on the ring most rapidly?



7. Which of the following would be the most likely to undergo a nucleophilic aromatic substitution with hydroxide ion in normal conditions?

- Benzene
- Chlorobenzene
- Benzoic acid
- p-Chlorotoluene
- 2,4,6-Trinitro-1-chlorobenzene

8. In the reaction of 2-nitrotoluene with bromine in the presence of iron, which of the products shown below is the most abundant in the mixture?



9. Which compound will reduce C=O but not C=C (at least not much)?

- Jones' Reagent
- PCC
- LiAlH_4
- NaBH_4
- Chromic Acid

10. Alkoxymercuration followed by borohydride reduction would be used to produce

- an alcohol from an alkene.
- an aldehyde from alcohol.
- an acid from an alkyne.
- an ether from an alkene.
- an alkene from an aryl halide.

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16. Choose the reagent(s) that would bring about the following reaction:

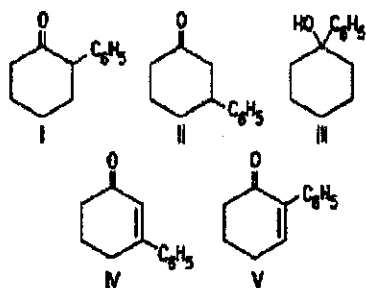
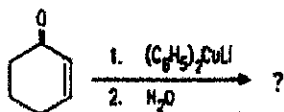


- A. H_2/Ni
- B. $\text{Li}/\text{liq NH}_3$
- C. $\text{LiAlH}_4[\text{OC}(\text{CH}_3)_3]_3$
- D. $\text{NaBH}_4, \text{CH}_3\text{OH}$
- E. $\text{LiAlH}_4, \text{ether}$

17. The IR spectrum of a compound exhibits a broad absorption band at $2500\text{-}3000\text{ cm}^{-1}$ and a sharp band at 1710 cm^{-1} . Which of these compounds could it be?

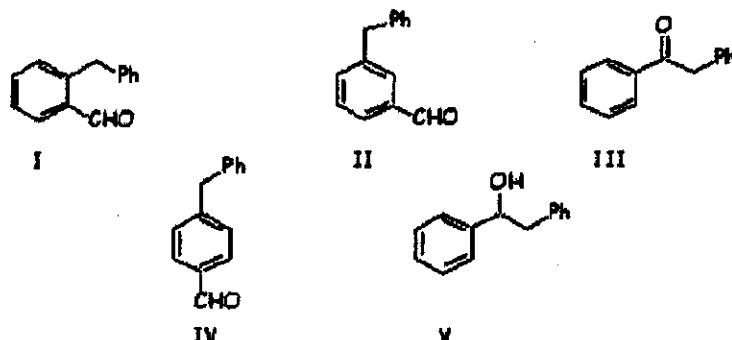
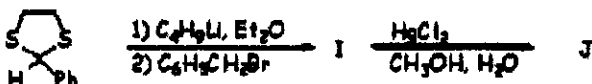
- A. 1-Butanol
- B. Propyl acetate
- C. Butanoic acid
- D. Acetyl chloride
- E. Acetic anhydride

18. What is the product of the reaction below?



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

19. What is the structure for J?



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

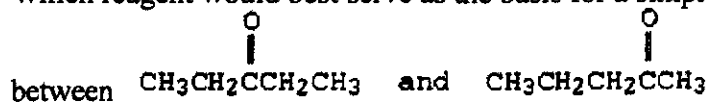
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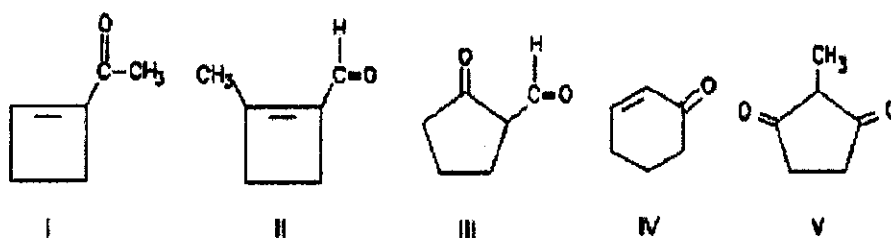
20. Which reagent would best serve as the basis for a simple chemical test to distinguish



- A. NaOI (I₂ in NaOH) B. Br₂/CCl₄
 C. CrO₃/H₂SO₄ D. NaHCO₃/H₂O
 E. Ag(NH₃)₂⁺

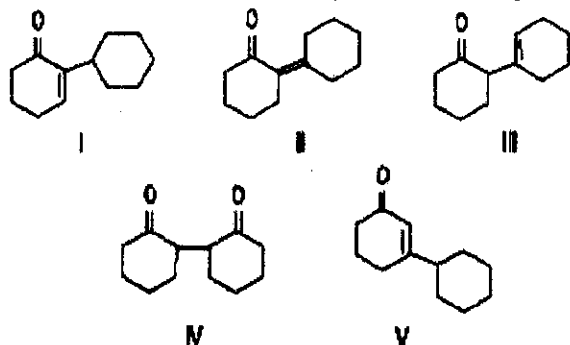
21.

The aldol cyclization of $\text{CH}_3\overset{\text{O}}{\parallel}\text{CCH}_2\text{CH}_2\text{CH}_2\overset{\text{H}}{\parallel}\text{C}=\text{O}$ produces which of these?



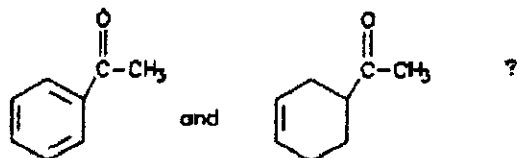
- A.I B.II C.III D.IV E.V

22. The aldol reaction of cyclohexanone produces which of these self-condensation products?



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

23. Which reagent would best serve as the basis for a simple chemical test to distinguish between



- A. NaOI (I₂ in NaOH) B. Br₂/CCl₄
 C. CrO₃/H₂SO₄ D. NaHCO₃/H₂O
 E. Ag(NH₃)₂⁺

(背面仍有題目,請繼續作答)

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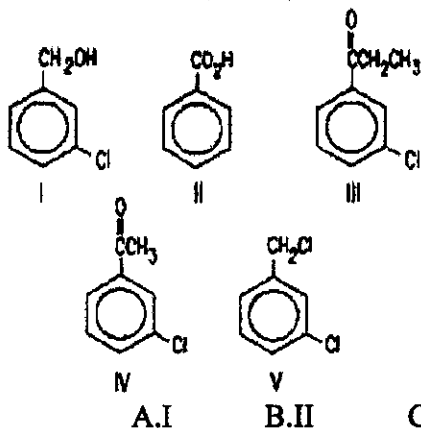
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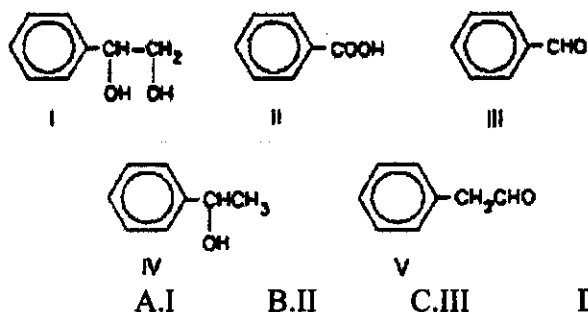
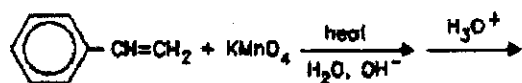
24. In a solution of acetic acid ($pK_a=4.74$) adjusted to a pH of 2.74,

- A. the ratio of acetate to acetic acid is 10 to 1.
- B. the ratio of acetate to acetic acid is 100 to 1.
- C. the ratio of acetate to acetic acid is 1000 to 1.
- D. the ratio of acetate to acetic acid is 1 to 10.
- E. the ratio of acetate to acetic acid is 1 to 100.

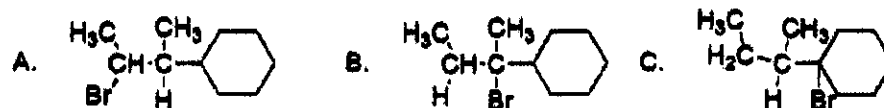
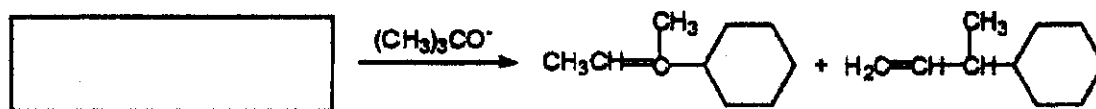
25. Which compound could be subjected to a haloform reaction to produce m-chlorobenzoic acid?



26. Predict the major organic product of the reaction sequence below



27. What is the starting material in the reaction below?



D. B and C

E. none of the above

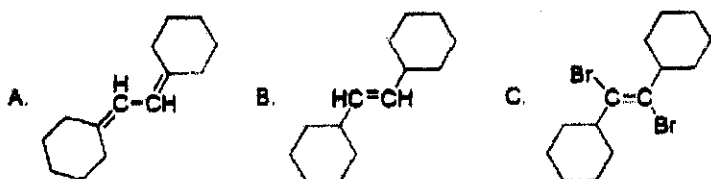
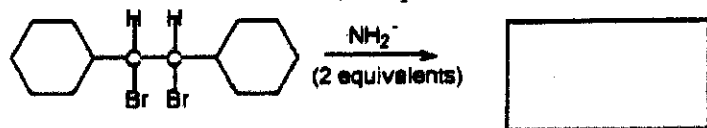
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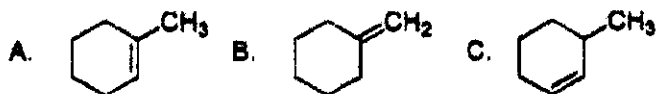
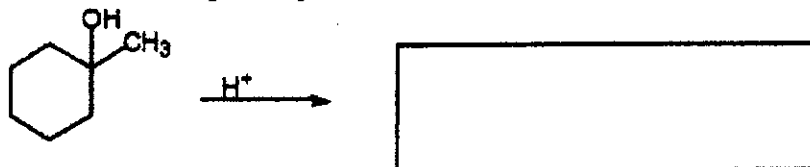
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28. In the reaction below, the product would be

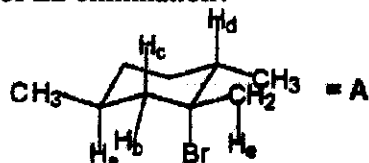


29. What is the expected product?



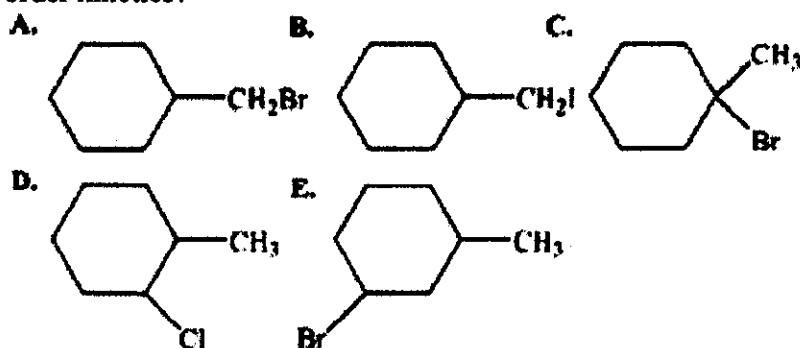
D. A and B E. A, B and C

30. Which of the labeled protons in compound A is most readily abstracted under conditions of E2 elimination?



A. Ha B. Hb C. Hc D. Hd E. He

31. Which of the following halides is most reactive in an elimination reaction having first order kinetics?



(背面仍有題目,請繼續作答)

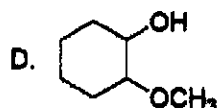
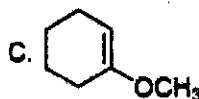
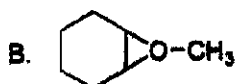
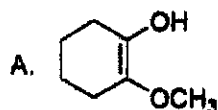
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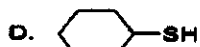
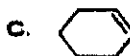
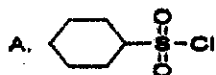
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32. Determine the product.



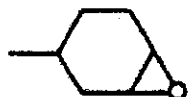
E. none of the above

33. What is the product?



E. none of the above

34. Give the IUPAC name for the following compound?



A. 1,2-epoxy-4-methylcyclohexane

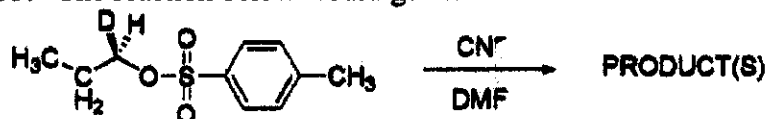
B. 3,4-epoxy-1-methylcyclohexane

C. 1,2-epoxy-3-methylcyclohexane

D. None of the choices are correct.

E. none of them

35. The reaction below would go via:



A. S_N1 mechanism with inversion

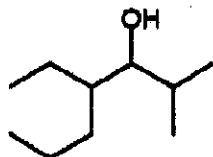
B. S_N1 mechanism with racemic product

C. S_N2 mechanism with stereoretention

D. S_N2 mechanism with racemic product

E. S_N2 mechanism with inversion

36. Give the IUPAC name for the following compound.



A. 3-ethyl-2-methyl-4-heptanol

B. 4-ethyl-6-methyl-5-heptanol

C. 4-ethyl-2-methyl-3-octanol

D. 4-ethyl-2-methyl-3-heptanol

E. None of the choices are correct.

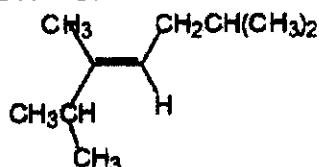
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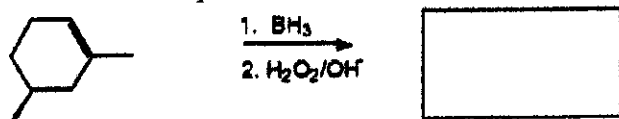
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37. Give the IUPAC name for the following compound.



- A. (Z)-2,3,6-trimethyl-2-heptene B. (Z)-2,3,6-trimethyl-3-heptene
 C. (E)-2,3,6-trimethyl-3-heptene D. (E)-2,3,6-trimethyl-2-heptene
 E. (E)-2,4,6-trimethyl-3-heptene

38. Predict the product.

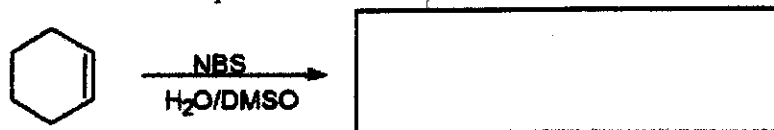


- A. B. C.
 D. E. A and B

39. A compound M with molecular formula C_8H_{12} and no triple bonds reacts with H_2 to give a new compound having molecular formula C_8H_{14} . What can be said about M?

- A. M has 3 rings. B. M has 2 rings and 1 π bond.
 C. M has 1 ring and 2 π bonds. D. M has 3 π bonds.
 E. It's impossible to say anything about the structure of M given this data.

40. Predict the product.



- A. B. C.
 D. none of the above

(背面仍有題目,請繼續作答)

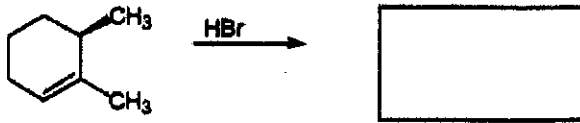
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41. Predict the product



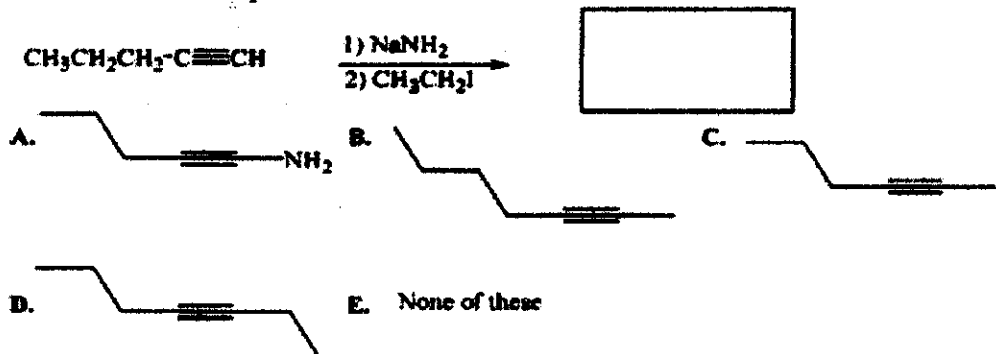
- A.
 B.
 C.
- D.
 E. A and B
 F. C and D

42. Predict the product.



- A.
 B.
 C.
- D. A and B
 E. A and C

43. Determine the product?



44. Which of the following is a keto-enol tautomeric pair?

- A.
 B.
 C.
- D.
 E.

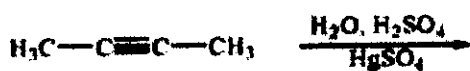
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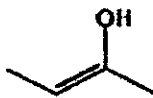
45. Determine the product



A.



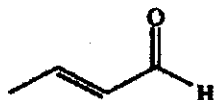
B.



C.



D.



E. None of the above

46. Identify the unknown compound that has all the following characteristics. (2 points)

Molecular formula: $\text{C}_{15}\text{H}_{14}\text{O}$

$^1\text{H NMR}$: singlet, δ 2.20 (3H)

singlet, δ 5.08 (1H)

multiplet, δ 7.25 (10H)

IR spectrum: strong peak at 1720 cm^{-1}

47. Identify the unknown compound that has all the following characteristics. (2 points)

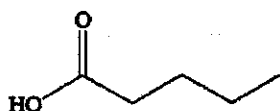
Molecular formula: $\text{C}_8\text{H}_9\text{Br}$

$^1\text{H NMR}$: doublet, δ 2.0 (3H)

quartet, δ 5.15 (1H)

multiplet, δ 7.35 (5H)

48. What distinguishing features would appear in the IR spectra of the following compounds? (i.e. give approximate absorption range and intensity).



49. Identify the unknown compound that has all the following characteristics. (2 points)

Molecular formula $\text{C}_{10}\text{H}_{12}\text{O}$.

IR: peak at 1710 cm^{-1}

$^1\text{H NMR}$: singlet, δ 2.1, 3H

multiplet, δ 3.0, 4H

multiplet, δ 7.1, 5H

50. Which is (are) the least shielded?

