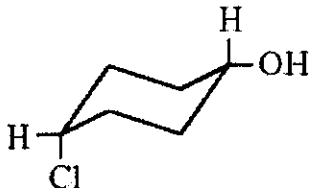


本試題是否可以使用計算機: 可使用, 不可使用 (請命題老師勾選)

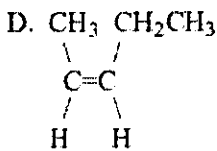
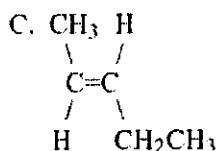
1-50 (2 points for each; wrong answer will deduct 1 point)

1. What is the name of the compound shown?

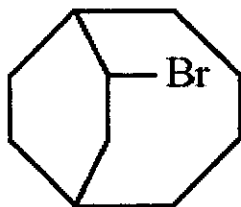


- A. *trans*-4-chlorocyclohexanol
 B. *cis*-4-chlorocyclohexanol
 C. *trans*-1-chloro-4-cyclohexanol
 D. *cis*-1-chloro-4-cyclohexanol

2. Which of the alkenes shown has the greatest heat of combustion?



3. What is the name of the compound shown?

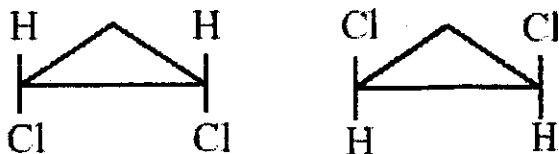


- A. 2-bromobicyclo[4.2.2]decane
 B. 3-bromobicyclo[4.2.2]decane
 C. 7-bromobicyclo[4.2.2]decane
 D. 8-bromobicyclo[4.2.2]decane

4. What is the most important reason for the fact that cyclohexane is the most stable of the cycloalkanes of twelve carbons or less?

- A. There is eclipsing along two of the carbon-carbon bonds in the boat conformation.
 B. There is eclipsing along four of the carbon-carbon bonds in the chair conformation.
 C. Both torsional and bond angle strain are minimized in the chair conformation.
 D. Both torsional and bond angle strain are minimized in the boat conformation.

5. What is the relationship between the compounds shown?

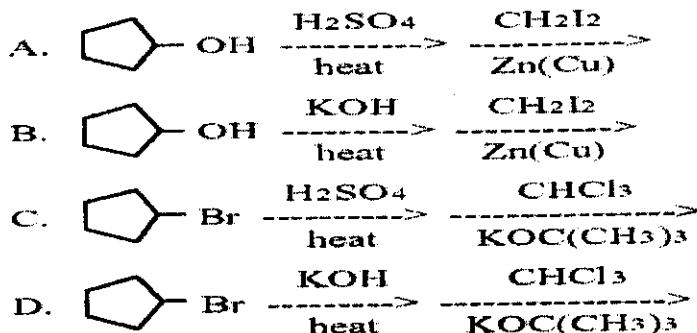


- A. Same compound B. Enantiomers C. Diastereomers D. Structural isomers

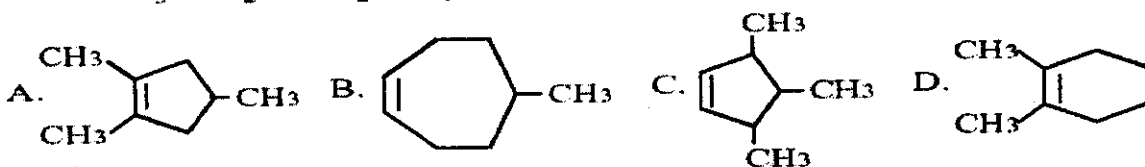
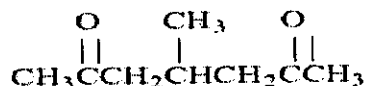
(背面仍有題目,請繼續作答)

本試題是否可以使用計算機： 可使用， 不可使用（請命題老師勾選）

6. Which of the following sequences can be used to make



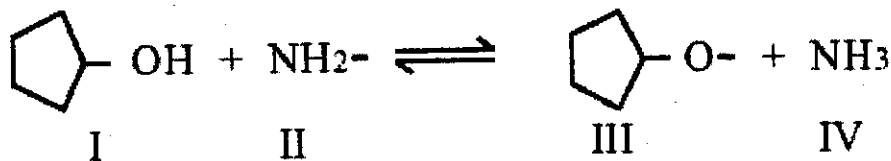
7. An unknown alkene was subjected to ozonolysis, and the product of the reaction was the compound shown. What is the structure of the unknown?



8. Which of the following sequences gives cyclohexane from cyclohexanol?

- A. KOH, alcohol, heat; then Zn, HCl
 B. Zn, HCl; then H₂, Pd
 C. H₂, Ni; then H₂SO₄, heat
 D. H₂SO₄, heat; then H₂, Pt

9. What are the bases in the reaction shown?



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

10. Which of the S_N2 reactions below is the FASTEST?

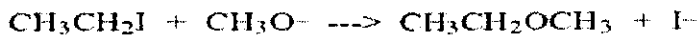
- A. CH₃Br + HC≡C⁻ → CH₃C≡CH + Br⁻
 B. CH₃Br + HC≡CH → CH₃C≡CH + HBr
 C. CH₃CH₂Br + HC≡C⁻ → CH₃CH₂C≡CH + Br⁻
 D. CH₃CH₂Br + HC≡CH → CH₃CH₂C≡CH + HBr

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11.

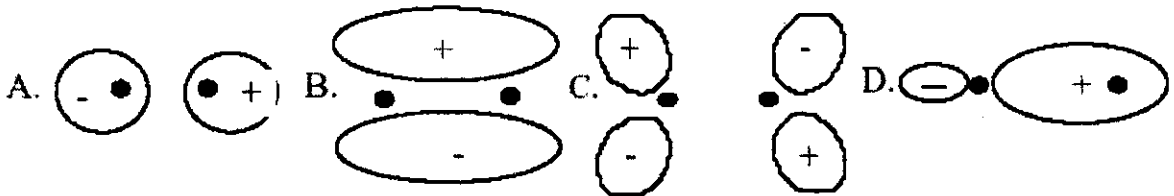
Rate data for the reaction shown is given in the table at right. What is the mechanism of this reaction?

Run no.	[CH ₃ CH ₂ I]	[CH ₃ O ⁻]	Rel. Rate
1	0.01	0.01	1
2	0.02	0.01	2
3	0.01	0.02	2



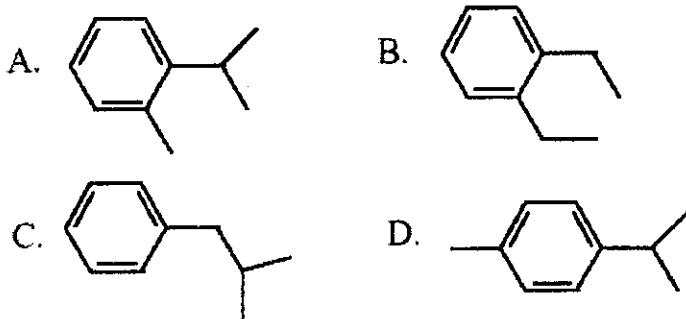
A. S_N1 B. S_N2 C. E1 D. E2

12. Which of the following is a sigma (σ) bonding orbital? Nuclei are indicated by solid dots, and the signs of the wave functions are shown.



13. What is the structure of the compound having the formula C₁₀H₁₄ and the following proton NMR spectrum data?

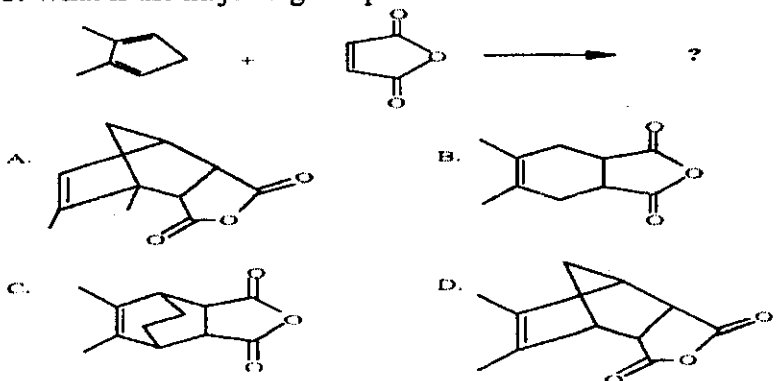
δ 7.1 ppm, multiplet, 4 H
δ 2.8 ppm, septet, 1 H
δ 2.3 ppm, singlet, 3 H
δ 1.2 ppm, doublet, 6 H



14. Which of the following functional groups is present in all polypeptides?

A. Alcohol B. Carboxylic acid C. Amine D. Amide

15. What is the major organic product of the reaction shown?



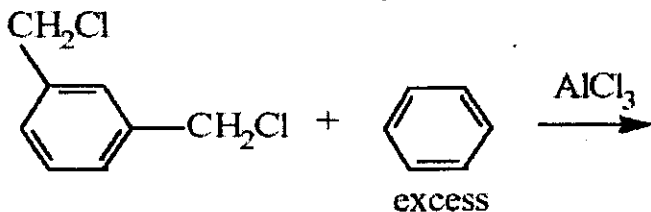
(背面仍有題目,請繼續作答)

編號：F 434
429

系所：生物化學暨分子生物學研究所甲組 科目：有機化學

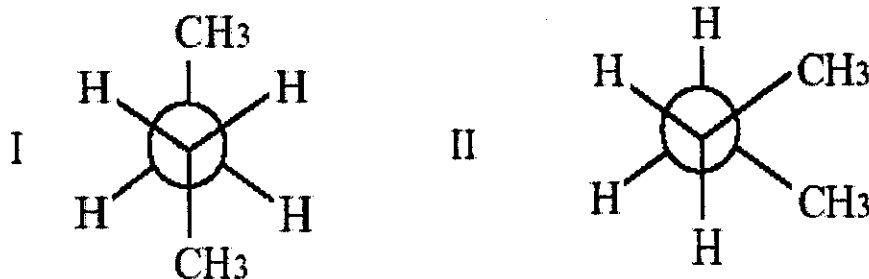
本試題是否可以使用計算機： 可使用， 不可使用（請命題老師勾選）

16. What is the major organic product expected from the following reaction?



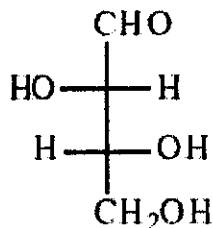
- A. B.
- C. D.

17. Which of the following statements about the relative stabilities of the structures shown is true?



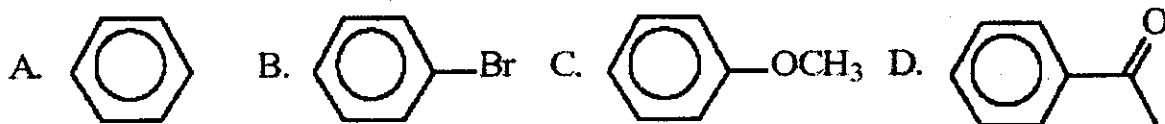
- A. I has more torsional strain.
 B. I has more steric strain.
 C. II has more torsional strain.
 D. II has more steric strain.

18. Which of the following terms does NOT describe the carbohydrate shown?



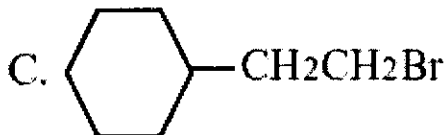
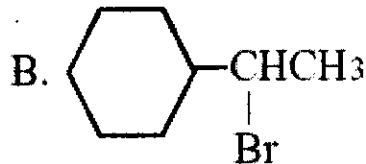
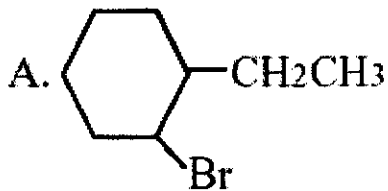
- A. L sugar B. Reducing sugar C. Aldose D. Tetrose

19. Which of the following compounds will react the SLOWEST with $\text{Cl}_2/\text{FeCl}_3$?

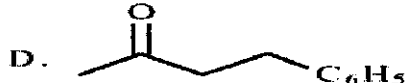
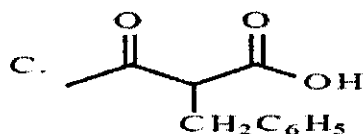
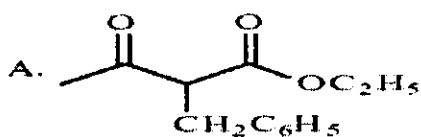


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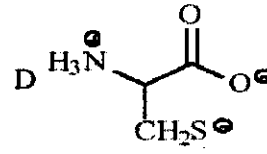
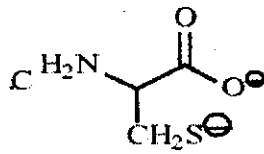
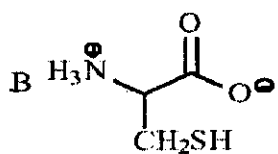
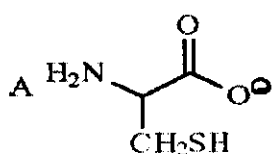
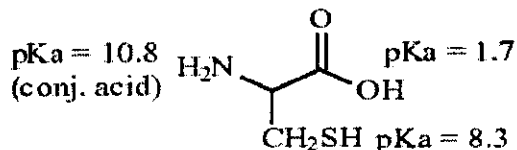
20. Which of the following compounds gives the SLOWEST SN1 reaction?



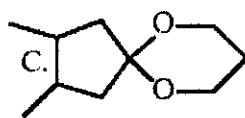
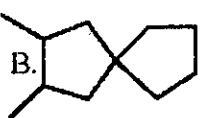
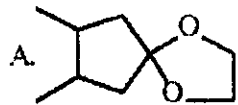
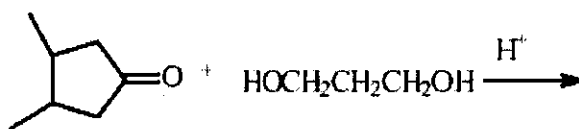
21. What is the product of the following sequence of reactions?



22. What is the dominant form of cysteine (shown below) at pH = 9?



23. What is the product of the reaction shown?



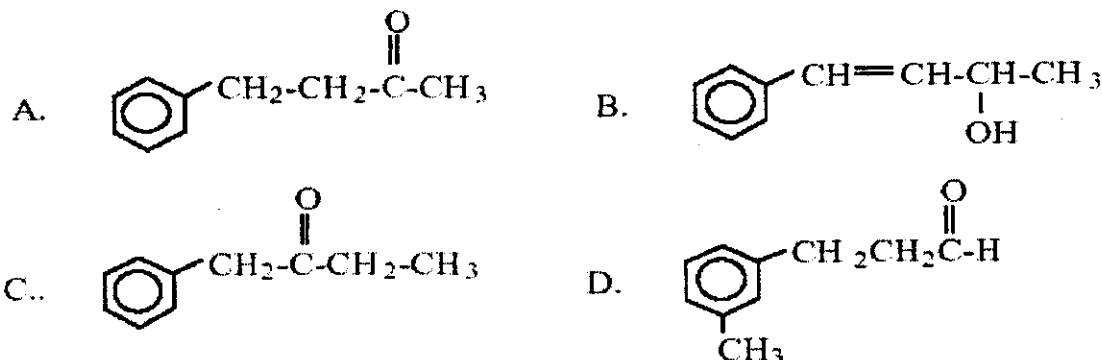
(背面仍有題目, 請繼續作答)

編號：F 434

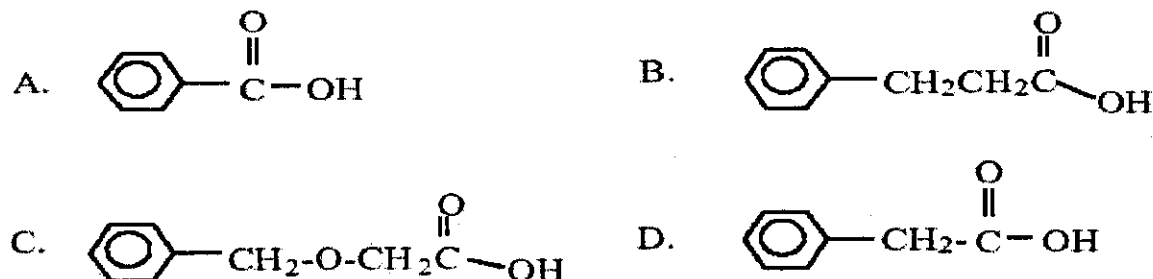
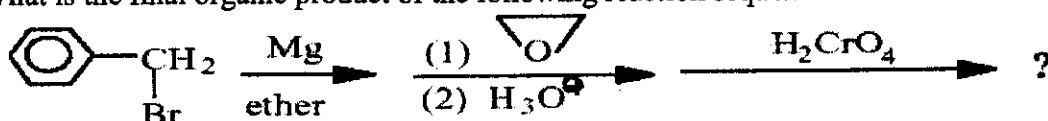
系所：生物化學暨分子生物學研究所甲組 科目：有機化學

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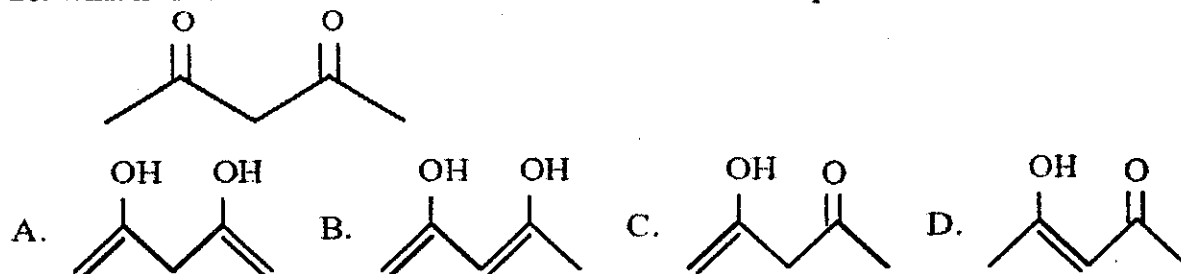
24. Compound X has the molecular formula $C_{10}H_{12}O$. The IR spectrum of X has a strong band near 1710 cm^{-1} . Compound X forms a phenylhydrazone, but gives a negative Tollens' test and a positive iodoform test. What is the structure of the compound?



25. What is the final organic product of the following reaction sequence?



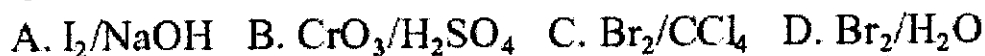
26. What is the structure of the most stable enol form of the compound shown?



27. Consider the reaction $(CH_3)_2CHI + CH_3OH \rightarrow (CH_3)_2CHOCH_3 + HI$. What is the mechanism of the reaction? Use the following data table

	$[(CH_3)_2CHI]$	$[CH_3OH]$	rel. rate
A. S_N1			
B. S_N2	0.02	0.02	1
C. E1	0.04	0.02	2
D. E2	0.04	0.04	2

28. Which of the following reagents can be used to distinguish between 1-pentanol and 2-pentanol?

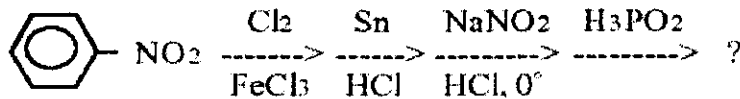


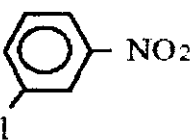
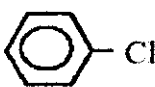
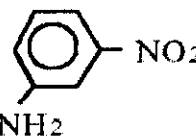
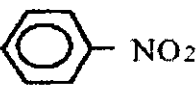
本試題是否可以使用計算機: 可使用, 不可使用 (請命題老師勾選)

29. What is the most stable conformation of *cis*-3-*tert*-butyl-1-methylcyclohexane?

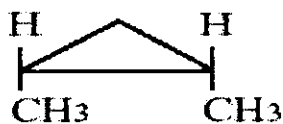
- A. The methyl group is axial and the *tert*-butyl group is equatorial.
- B. The *tert*-butyl group is axial and the methyl group is equatorial.
- C. Both groups are axial.
- D. Both groups are equatorial.

30. What is the product of the reaction sequence shown?



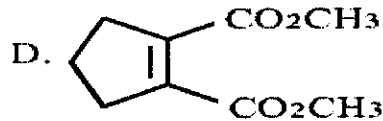
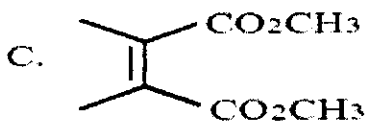
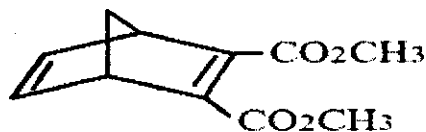
- A. 
- B. 
- C. 
- D. 

31. How many signals are present in the proton nmr spectrum of the compound shown? (Neglect signal splitting).

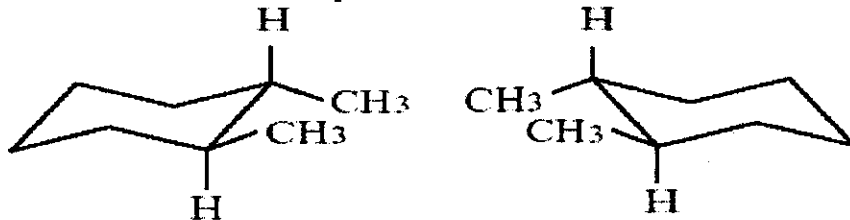


- A. 1
- B. 2
- C. 3
- D. 4

32. What dienophile is used to synthesize the compound shown?



33. What is the relationship between the compounds shown?

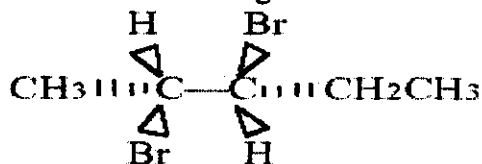


- A. Same compound
- B. Diastereomers
- C. Enantiomers
- D. Structural (constitutional) isomers

(背面仍有題目, 請繼續作答)

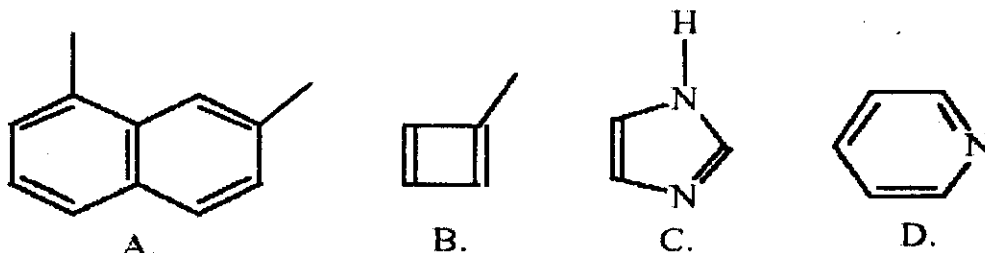
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34. What is the configuration of the compound shown?

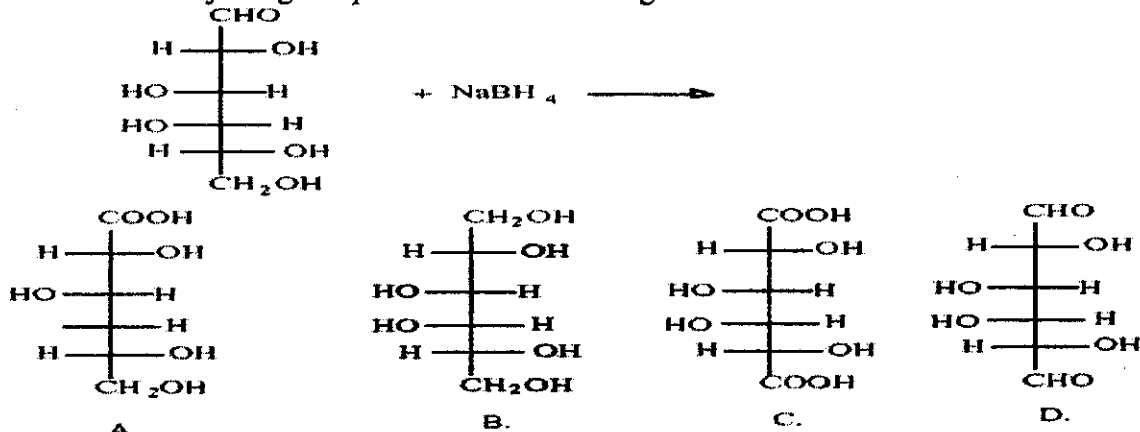


- A. 2R, 3R B. 2R, 3S C. 2S, 3R D. 2S, 3S

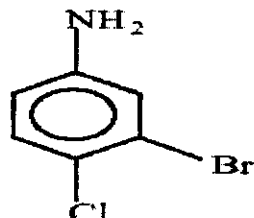
35. Which of the following compounds will decolorize Br₂ in CCl₄?



36. What is the major organic product of the following reaction?

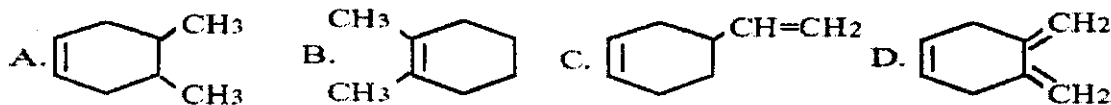
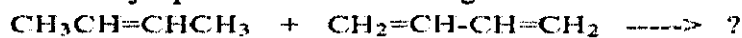


37. What is the IUPAC name of the compound shown?



- A. 1-chloro-2-bromo-4-anisole
 B. 3-bromo-4-chloroanisole
 C. 1-bromo-2-chloro-5-aniline
 D. 3-bromo-4-chloroaniline

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



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39. What is the final product of the reaction sequence shown?



- A. $\text{C}_6\text{H}_5\text{C}(\text{CH}_3)=\text{CH}_2$ B. $\text{C}_6\text{H}_5\text{C}(\text{CH}_3)_2$ C. $\text{C}_6\text{H}_5\text{CH}=\text{CHCH}_3$ D. $\text{C}_6\text{H}_5\text{C}(\text{CH}_3)(\text{OH})$

40. Which of the following statements about pyridine is NOT true?

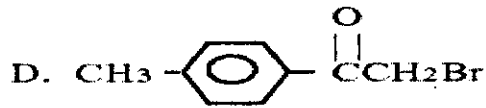
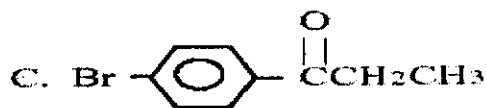
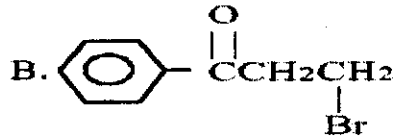
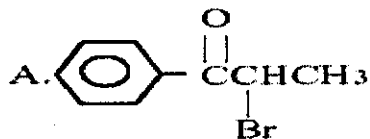
- A. Pyridine is an aromatic compound.
 B. All of the atoms that make up the pyridine molecule lie in the same plane.
 C. Pyridine is a weak base because it would become nonaromatic if it accepted a proton.
 D. Pyridine has a cyclic pi system.

41. Nucleophiles attack the carbonyl carbons of aldehydes and ketones because:

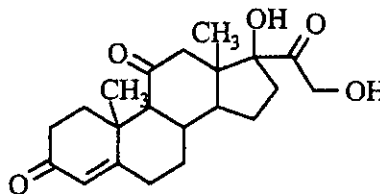
- A. the α hydrogens of aldehydes and ketones are relatively acidic.
 B. the carbonyl carbon is the positive end of a dipole.
 C. the carbonyl carbon does not have a good leaving group bonded to it.
 D. the carbonyl carbon is the negative end of a dipole.

42. A compound having the formula $\text{C}_9\text{H}_9\text{BrO}$ gives an IR spectrum containing a peak near 1680 cm^{-1} . Its proton nmr spectrum follows:
 doublet, δ 1.0, 3H
 quartet, δ 5.3, 1H
 multiplet, δ 7.5, 3H
 multiplet, δ 8.0, 2H

What is the structure of this unknown?



43. How many chiral centers do the drug cortisone have?



- A. 3
 B. 4
 C. 5
 D. 6

(背面仍有題目,請繼續作答)

本試題是否可以使用計算機: 可使用, 不可使用 (請命題老師勾選)

44-48. Deduce the structure for each of the following compounds from the given $^1\text{H-NMR}$ spectra.

44. C_6H_{14} : δ 0.8 d, 12H; 1.4 sept, 2H

45. $\text{C}_3\text{H}_3\text{Cl}_3$: δ 4.52 t, 1H; 6.07 d, 2H

46. $\text{C}_3\text{H}_5\text{Cl}_3$: δ 2.30 s, 3H; 4.02 s, 2H

47. $\text{C}_4\text{H}_6\text{Cl}_2$: δ 2.2 s, 3H; 4.1 d, 2H; 5.7 t, 1H

48. $\text{C}_4\text{H}_7\text{BrO}$: δ 2.11 s, 3H; 2.62 t, 2H; 3.80 t, 2H

49-50. Please provide the necessary steps in detail.

49.



50.

