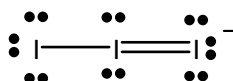


Organic Chemistry

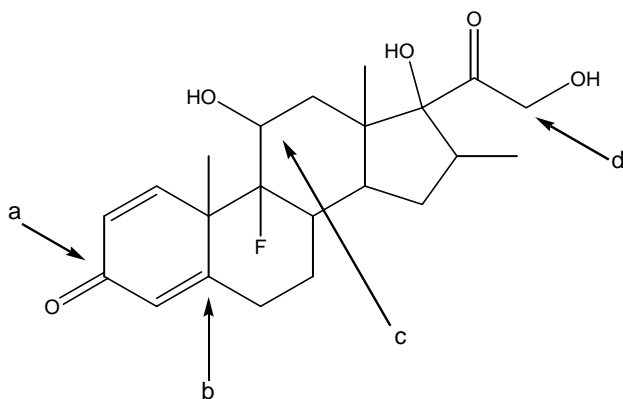
1. According to the VSEPR model, what is the shape of the I_3^- anion?

- a) linear
- b) bent
- c) trigonal planar
- d) tetrahedral

Ans: (a) linear. Below is the Lewis dot diagram



2. Betamethasone is a drug widely prescribed for rheumatoid arthritis. What is the approximate bond angle of atom (a)?

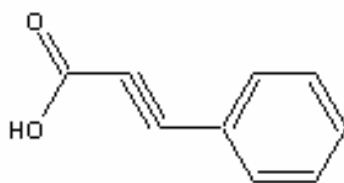


- a) 120°
- b) 120°
- c) 109°
- d) 109°

Ans: (a) 120° It is SP^2 hybridized.

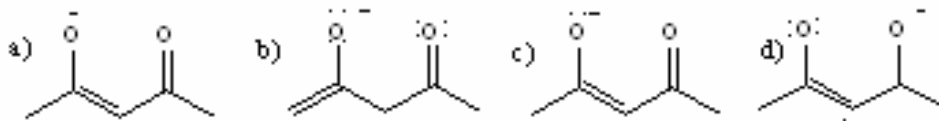
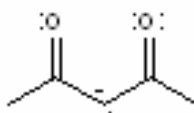
3. How many π -bonds are there in the molecule below?

- a) 3
- b) 4
- c) 5
- d) 6

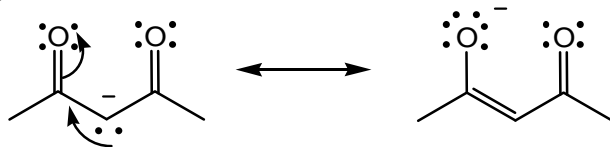


Ans: d): there are 6 π -bonds

4. Which of the following is a correct and important resonance form of the acetylacetonate anion shown below?



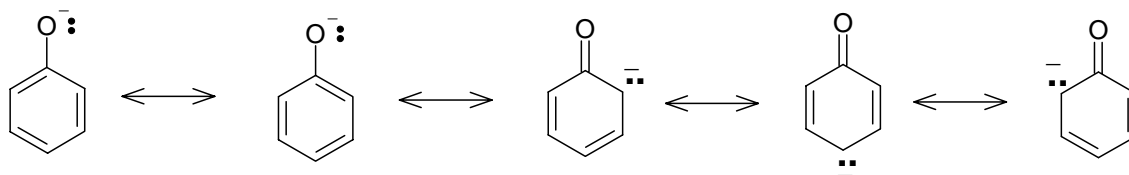
Ans: (c)



5. How many important resonance forms can be constructed for the phenoxide anion, $C_6H_5O^-$?

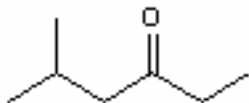
- a) 4
- b) 5
- c) 6
- d) 7

Ans: b): There are 5 resonance forms, as shown below

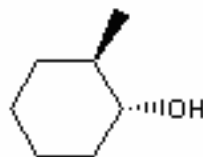


6. Which compound below is NOT a constitutional isomer of 1-methylcyclohexanol?

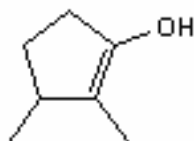
(a)



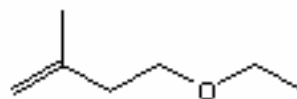
(b)



(c)

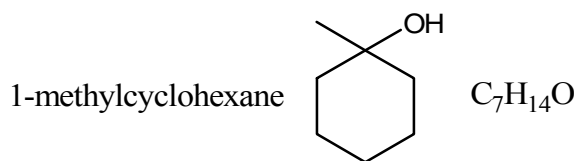


(d)



Ans:

(c)



constitutional isomer \rightarrow same molecular formula, but different connectivity of atoms

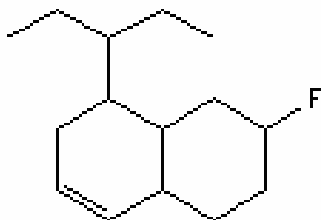
7. How many stereocentres does the following organic molecule contain?

(a) 3

(b) 4

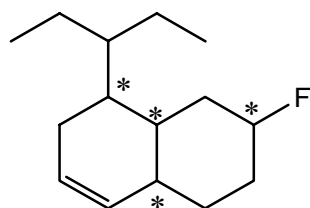
(c) 5

(d) 6



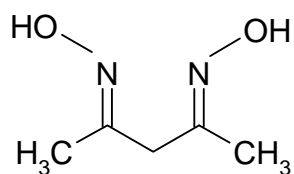
Ans:

(b)



stereocentres marked with *

8. Consider the compound below known as dimethylglyoxime:



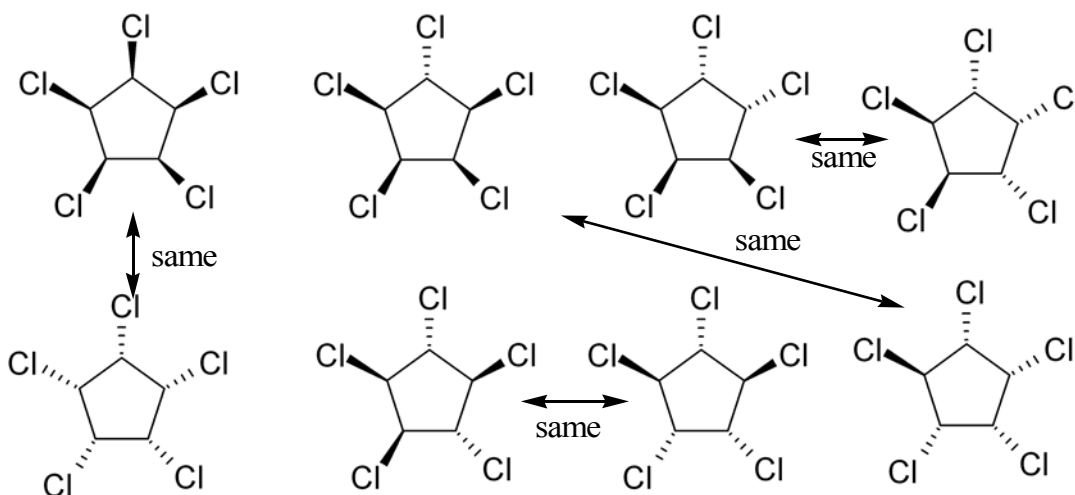
Which one of the following statements best describes the hybridization of the atoms in this molecule?

- (a) There are two sp^3 N atoms and two sp^3 O atoms.
- (b) All of the C atoms are sp^3 hybridized.
- (c) There are two sp^2 C atoms and two sp^3 N atoms.
- (d) There are three sp^3 C atoms and two sp^2 N atoms.

Ans: (d): The nitrogen atoms are sp^2 hybridized, and three of the five carbons are sp^3 hybridized.

9. How many cis-trans diastereomers are possible for 1,2,3,4,5-pentachlorocyclopentane?
- a) 2
 - b) 4
 - c) 6
 - d) 8

Ans: b)



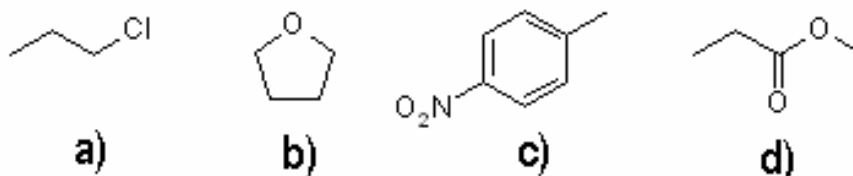
each of these pairs are the same if you flip them over.

10. The *S* enantiomer of the amino acid alanine, $\text{CH}_3\text{CH}(\text{NH}_2)\text{COOH}$, rotates plane-polarized light to the left. How will the *R* enantiomer of alanine affect plane-polarized light?

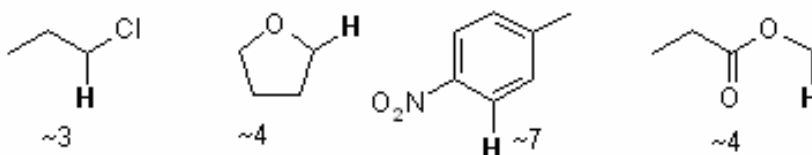
- (a) The *R* enantiomer will rotate plane-polarized light to the left to a lesser degree.
- (b) The *R* enantiomer will rotate plane-polarized light to the left to a greater degree.
- (c) The *R* enantiomer will rotate plane-polarized light to the right.
- (d) The *R* enantiomer will not rotate plane-polarized light.

Ans: (c) : when one enantiomer rotates plane-polarized light to the right, the other rotates plane-polarized light to the left (and vice versa).

11. Which of the structures shown below contains the most deshielded proton?



Ans: c) We are looking for the proton with the highest chemical shift (most deshielded).

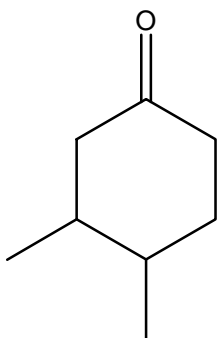


12. Given the empirical formulae and spectroscopic data below, what is the structure of unknown I?

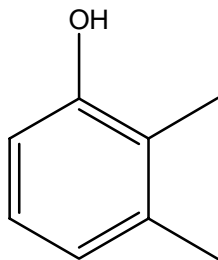
Unknown I ($C_8H_{10}O$)

IR: broad absorption band $\sim 3300\text{cm}^{-1}$

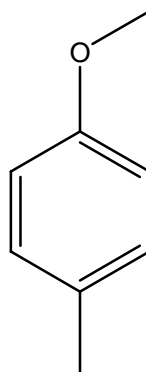
$^1\text{H NMR}$ δ : 7.8 d 2H; 7.4 d 2H; 3.8 s 1H; 3.3 q 2H; 1.8 t 3H



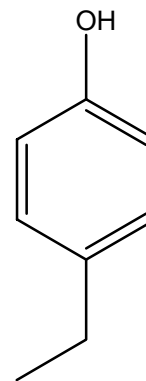
a)



b)



c)



d)

Ans: d)

I:

$$1. \quad \text{D.O.U} = \frac{(8 \times 2 + 2 - 10)}{2} = 4$$

This suggests that there is a benzene ring present

2. I.R. indicates that there is an alcohol present in the molecule

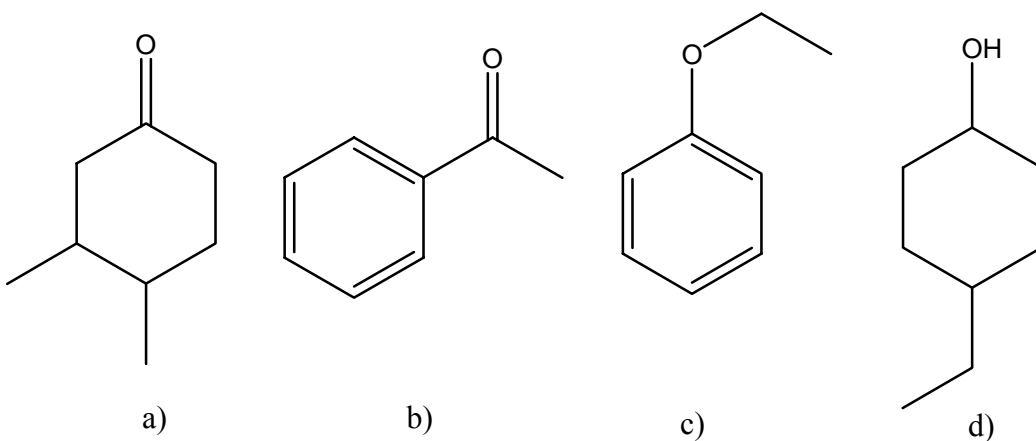
3. NMR indicates that molecule is a para disubstituted benzene ring. 3.8 s 1H is the alcohol proton, and 3.3 q 2H and 1.8 t 3H corresponds to an ethyl group. Therefore, the structure must be:

13. Given the empirical formulae and spectroscopic data below, what is the structure of unknown II?

Unknown II (C_8H_8O)

IR: intense band at 1666cm^{-1}

$^1\text{H NMR}$ δ : 8.1 d 2H; 7.8 t 1H; 7.4 m 2H; 2.3 s 3H



Ans: b)

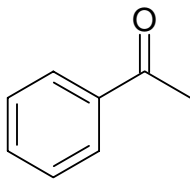
II:

$$1. \quad \text{D.O.U} = (8 \cdot 2 + 2 - 8) / 2 = 5$$

This suggests that there is a benzene ring present

2. I.R. indicates that there is a carbonyl group present. This with a benzene ring would take care of all 5 degrees of unsaturation.

3. NMR shows that the molecule is a monosubstituted benzene ring (just count the # of aromatic protons – don't worry about the splitting patterns!). All that is left is 2.3 s 3H, which is typical of a methyl group next to a carbonyl. Therefore, the structure is:

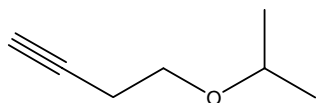


14. Given the empirical formulae and spectroscopic data below, what is the structure of unknown III?

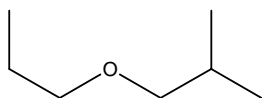
Unknown III ($C_7H_{12}O$)

IR: weak absorption bands $\sim 3300\text{cm}^{-1}$, 2150cm^{-1} and 1200cm^{-1}

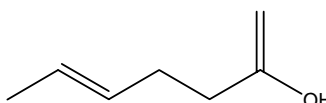
$^1\text{H NMR}$ δ : 4.3 heptet 1H; 4.1 t 2H; 3.8 t 2H; 2.1 s 1H; 1.8 d 6H



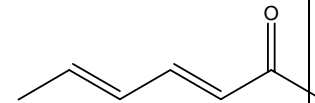
a)



b)



c)



d)

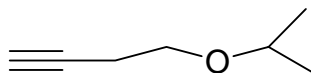
Ans: a)

III:

$$1. \quad \text{D.O.U} = (7 \cdot 2 + 2 - 12) / 2 \\ = 2$$

2. First glance at the I.R. suggests an OH group. However, the band at 3300cm^{-1} is WEAK and is therefore more likely an absorption from a terminal alkyne proton. There is a triple bond (which reinforces the above suspicion) and an ether group present in the molecule.

3. 2.1 s 1H is the terminal alkyne proton. A chemical shift of ~ 4 is typical of protons in an ether functional group. Therefore, the molecule must be:

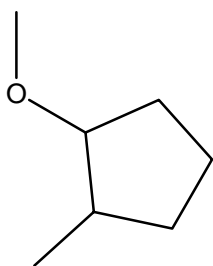


15. Given the empirical formulae and spectroscopic data below, what is the structure of unknown IV?

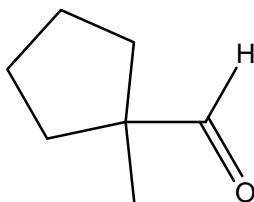
Unknown IV ($C_7H_{12}O$)

IR: intense bands 1720cm^{-1}

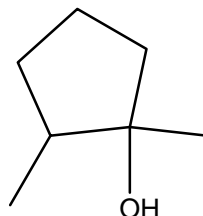
$^1\text{H NMR}$ δ : 9.1 s 1H; 1.9 t 4H; 1.8 multiplet 4H; 1.6 s 3H



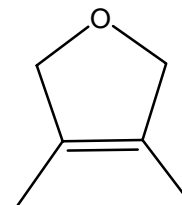
a)



b)



c)



d)

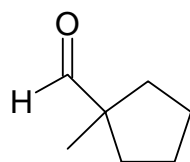
Ans: b)

IV:

$$1. \quad \text{D.O.U} = (7 \cdot 2 + 2 - 12) / 2 \\ = 2$$

2. I.R. indicates there is a carbonyl group present. That is only one degree of unsaturation, so there must either be 2 carbonyl groups or 1 carbonyl group and 1 ring.

3. 9.1 s 1H is typical of an aldehyde proton. 1.6 s 3H is a methyl group with no adjacent hydrogens. The other 2 bands don't tell us a whole lot except that the rest of the molecule is an alkyl chain. This suggests that the molecule contains a ring, and not a second carbonyl group (the chemical shifts would be higher if it did). Start with the aldehyde and methyl group, and then add a ring that fits the data:



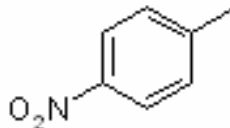
16. On the structures shown, what is the splitting pattern of the most deshielded proton (singlet (s), doublet (d), triplet (t), quartet (q), heptet (h) or multiplet (m))?



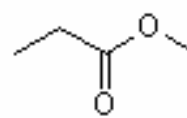
A



B



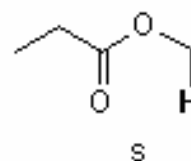
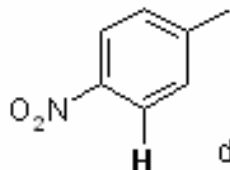
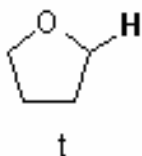
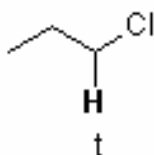
C



D

- a) A (s), B (s), C (t), D (s)
 b) A (d), B (t), C (s), D (s)
 c) A (t), B (d), C (d), D (d)
 d) A (t), B (t), C (d), D (s)

Ans: d)

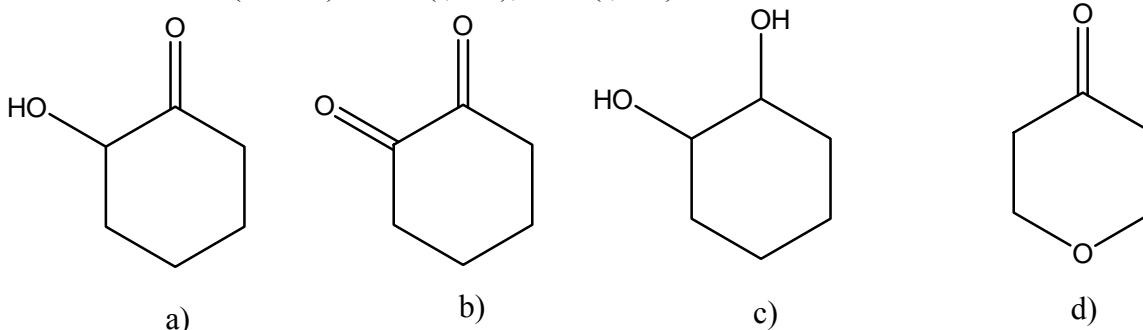


17. Given the spectroscopic data and empirical formulae below, what is the structure of compound I? [Note: s = singlet, t = triplet, m = multiplet].

Compound I ($C_5H_8O_2$)

IR: intense absorption band at 1688 cm^{-1}

$^1\text{H NMR}$ (CDCl_3): 4.1δ (t, 4H), 2.1δ (t, 4H)



Ans: d)

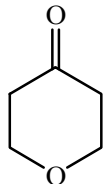
Compound I $C_5H_8O_2$

D.O.U = $[(2 \times 5 + 2) + 0 - 0 - 8] / 2 = 2$

IR: intense absorption at 1688 cm^{-1} , signifies presence of carbonyl group

$^1\text{H NMR}$ triplet, 4H at 4.1δ : two identical $-\text{CH}_2-$ groups located beside oxygen
triplet, 4H at 2.1δ : two identical $-\text{CH}_2-$ groups

Structure:

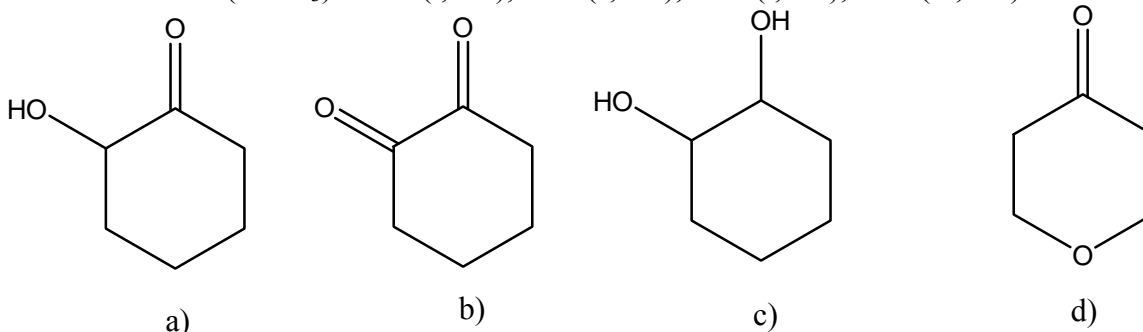


18. Given the spectroscopic data and empirical formulae below, what is the structure of compound II? [Note: s = singlet, t = triplet, m = multiplet].

Compound II ($C_5H_8O_2$)

IR: broad absorption band $3200\text{--}3600\text{ cm}^{-1}$; intense absorption band at 1670 cm^{-1}

$^1\text{H NMR}$ (CDCl_3): 4.5δ (t, 1H), 3.5δ (s, 1H), 2.2δ (t, 2H), 1.8δ (m, 4H)



Ans: a)

Compound II C₅H₈O₂

D.O.U= 2

IR: broad absorption band 3200-3600cm⁻¹, presence of -OH group

Intense absorption band 1670cm⁻¹, presence of carbonyl group.

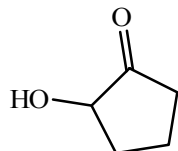
¹H NMR triplet, 1H 4, 5 δ, proton located beside a -CH₂- group and next to oxygen

singlet, 1H 3.5 δ, proton of -OH group

triplet, 2H 2.2 δ, a methylene group located beside another methylene group.

Multiplet, 4H 1.8 δ, most likely two methylene groups

Structure

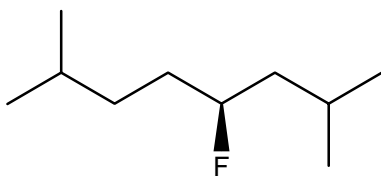


19. Which of the following solvents has the lowest boiling point?

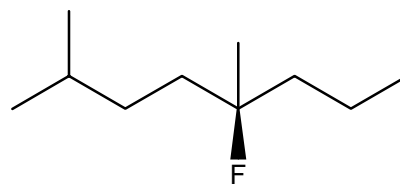
- a) ethanol b) hexane c) ether d) water

Ans: c) Ether. The boiling point of ether is 35 °C.

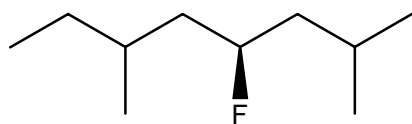
20. Which molecule is (4S)-fluoro-2,7-dimethyloctane?



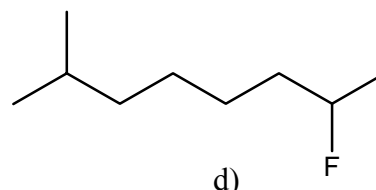
a)



b)



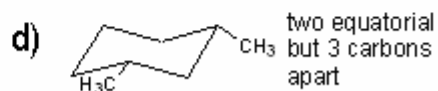
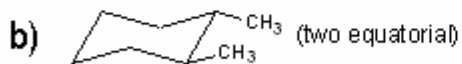
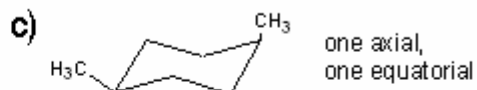
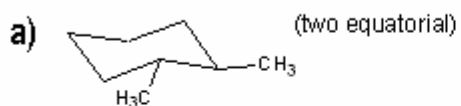
c)



d)

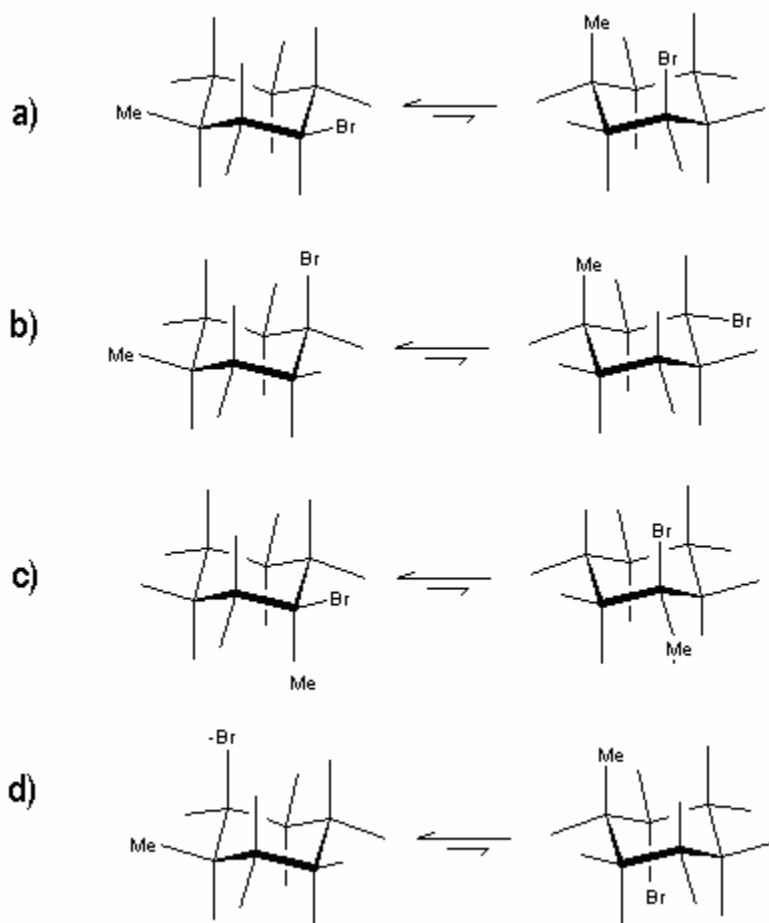
Ans: a)

21. For which of the below compounds will its two chair conformers be approximately of the same energy?



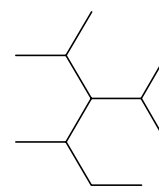
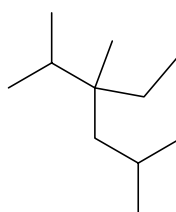
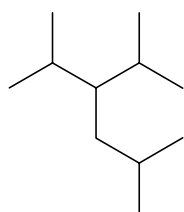
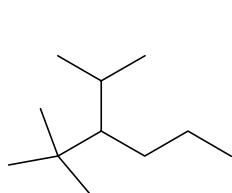
Ans. c)

22. Which of the structures below represent the chair forms of cis-1-bromo-3-methylcyclohexane?



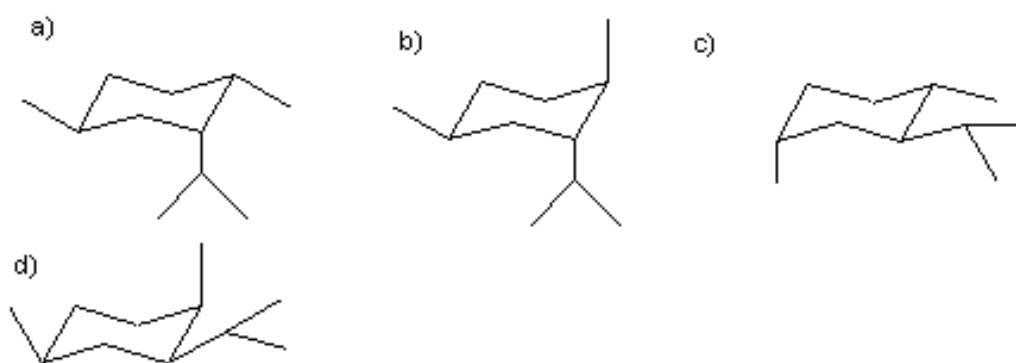
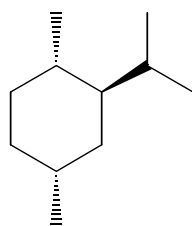
Ans: a)

23. Which of the structures below is 2,5-dimethyl-3-isopropylhexane?



Ans: b)

24. Which of the following structures represents the most stable conformation of the molecule shown below?



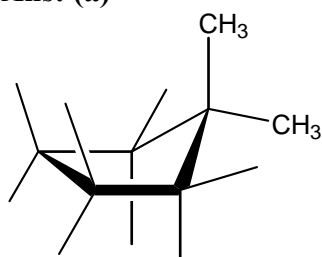
Ans: (c)

25. Which of the following statements about 1,1-dimethylcyclopentane are true?

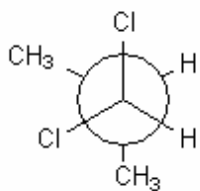
- (i) It is a saturated compound.
- (ii) It is a planar molecule.
- (iii) It has no ring strain.

- a) only (i) is true
- b) only (ii) is true
- c) only (iii) is true
- d) only (i) and (iii) are true

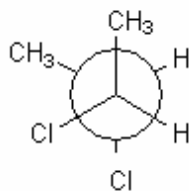
Ans: (a)



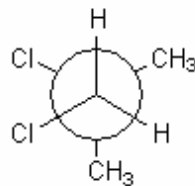
26. Which of the following structures is the Newman projection for the most stable conformation of (2*R*,3*R*)-2,3-dichlorobutane?



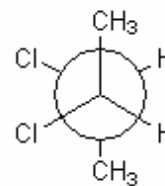
a)



b)

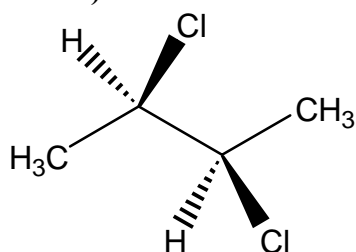


c)

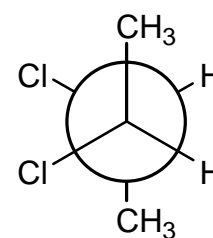


d)

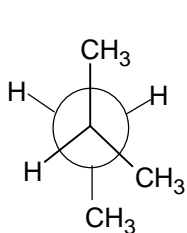
Ans. d)



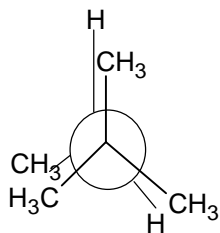
(build molecular model)



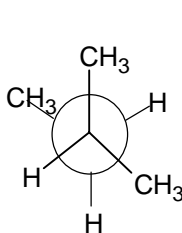
27. Consider the conformations of 2-methylbutane. Which structure(s) show(s) gauche interaction?



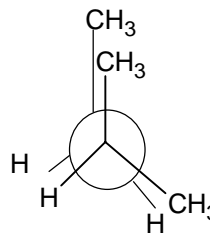
I



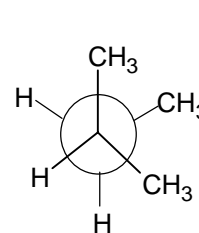
II



III



IV



V

- a) I, II, III
 b) I, IV, V
 c) II, III, V
 d) I, III, V

Ans: d) I, III, V

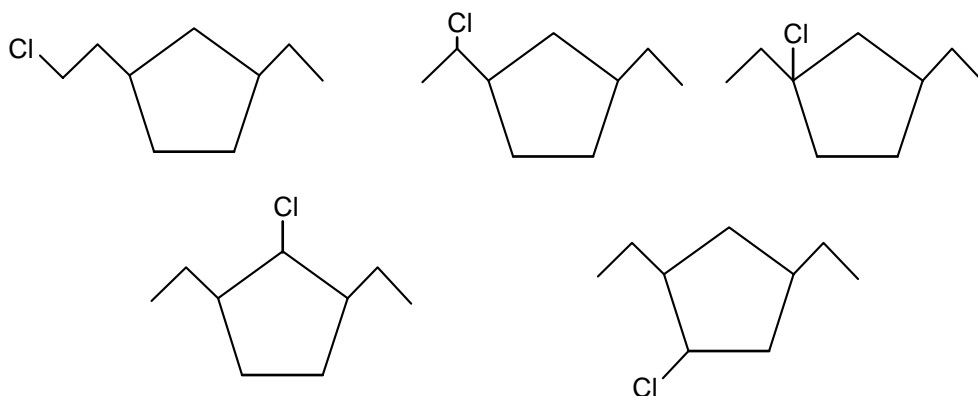
28. Which one of following statements about the radical mechanism of alkane chlorination is FALSE?
- Light or heat is required in the chain initiation step.
 - The chain termination step reduces the number of radicals present in the reaction
 - The major product of radical monochlorination of 2,3-dimethylbutane will be 2-chloro-2,3-dimethylbutane.
 - The alkyl radical intermediate generated during chain propagation is a positively charged species.

Ans: (d), radical intermediates are neutral species.

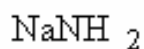
29. The number of constitutional isomers that could be generated by radical monochlorination of 1,3-diethylcyclopentane is

a) 4 b) 5 c) 8 d) 9

Ans: (b) constitutional isomers: same molecular formula, but different connectivity.



30. Of the following compounds, which ones can be used to generate ethoxide ion ($C_2H_5O^-$) from ethanol?



a)

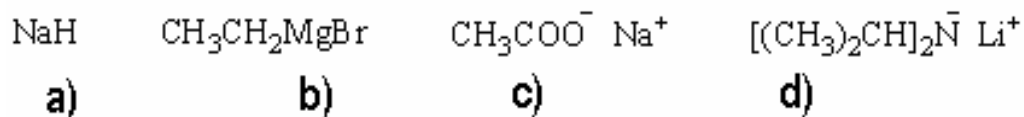
b)

c)

d)

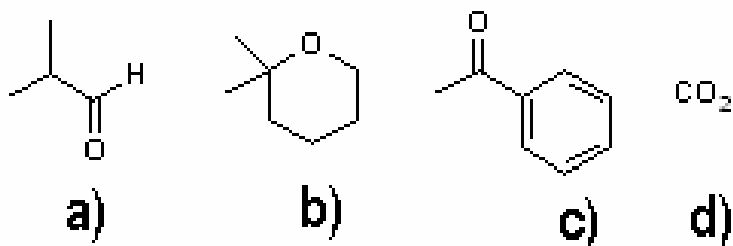
Ans: a)

31. Which of the following reagents given will not deprotonate $(CH_3)_3COH$ almost completely?



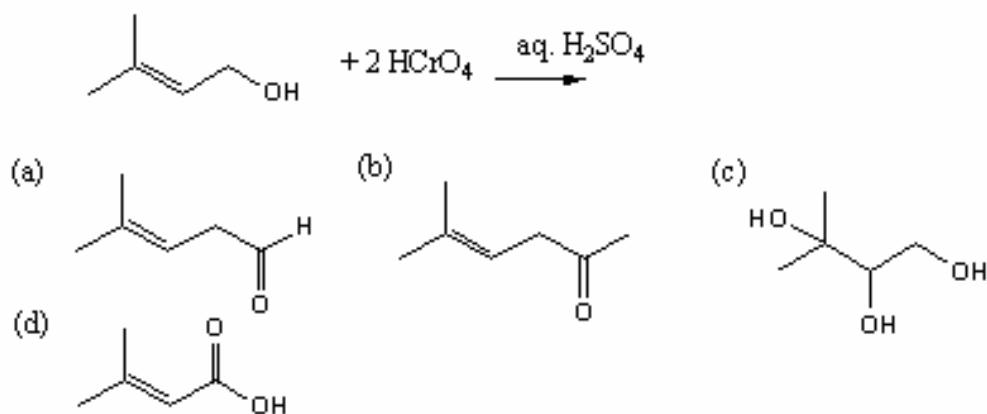
Ans: c)

32. Of the following compounds, identify the ones that will react with one equivalent of a Grignard reagent to form a tertiary alcohol.



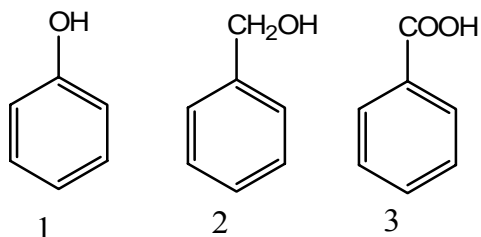
Ans: c) Ketones react with one equivalent of a Grignard reagent to give a tertiary alcohol. Keep in mind that Grignards will attack any acidic proton (ex: $-\text{OH}$) over a carbonyl group, generating an alkane instead of an alcohol.

33. Which of the following is the major product of this oxidation reaction:



Ans: d)

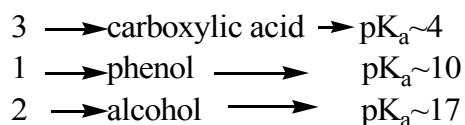
34. What is the order of increasing acid strength (weakest first, strongest last) of the set of compounds given below?



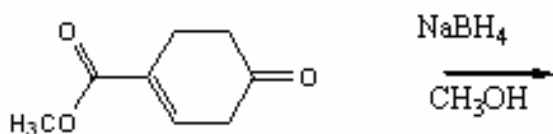
- (a) 1<2<3
 (b) 1<3<2
 (c) 2<1<3
 (d) 2<3<1

Ans: c) 2<1<3

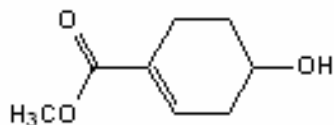
(c)



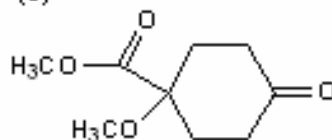
35. From the compounds below, choose the major product that will result from the following reaction:



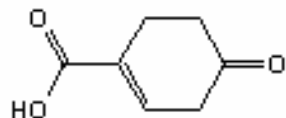
(a)



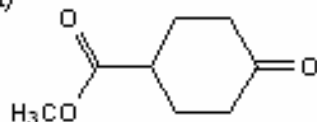
(b)



(c)

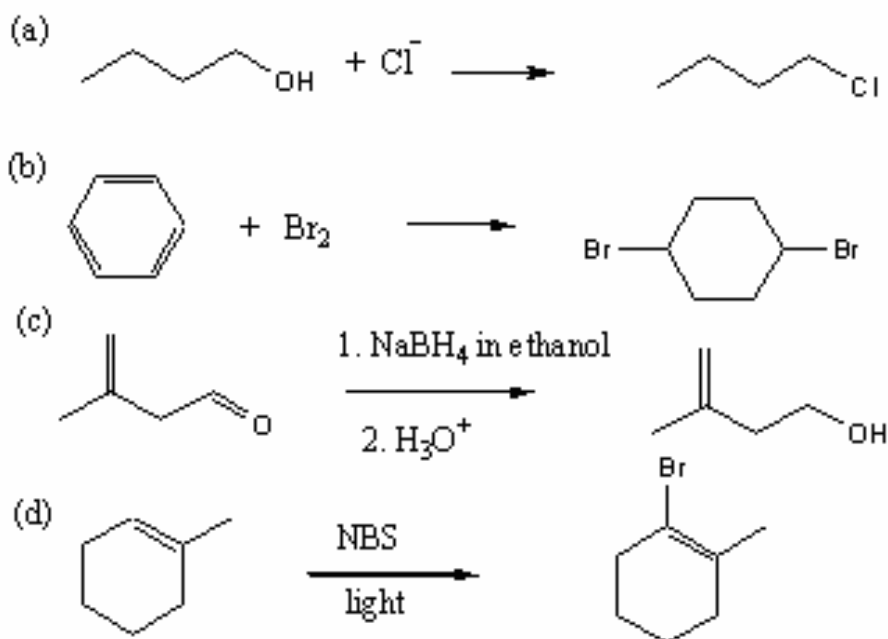


(d)



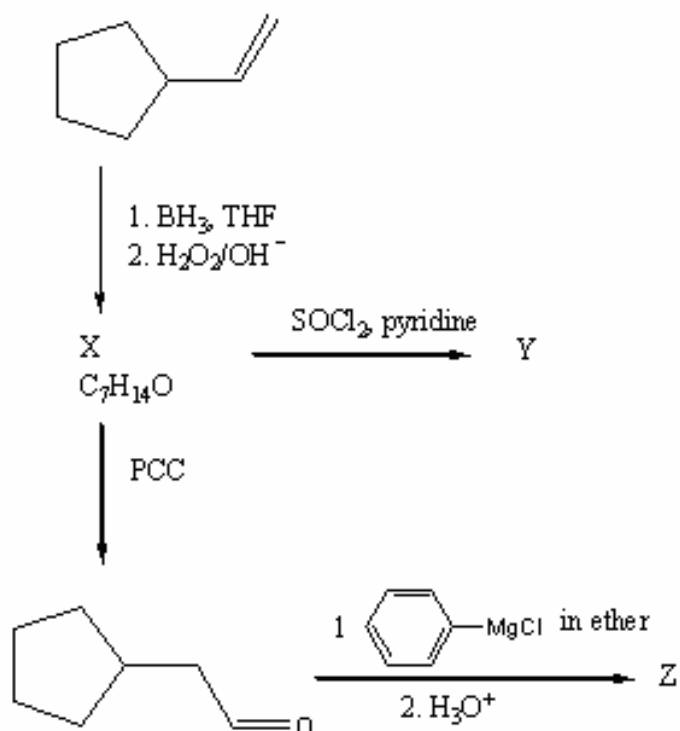
Ans: a) NaBH_4 , only reduces the ketone to the alcohol.

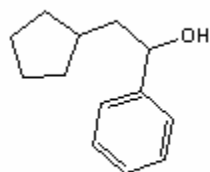
36. Which of the following reactions is most likely to occur?



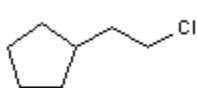
Ans: c) NaBH₄ is used to reduce aldehydes to alcohols.

37. From the reaction scheme below, what is the structure of the major organic products X?





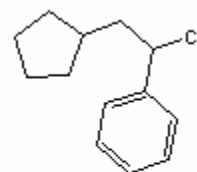
a)



b)



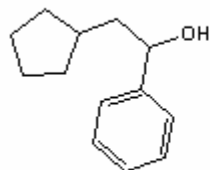
c)



d)

Ans: c)

38. From the reaction scheme shown in question 37, what is the structure of the major organic product Y?



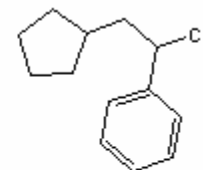
a)



b)



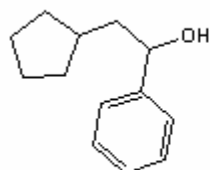
c)



d)

Ans: b)

39. From the reaction scheme shown in question 37, what is the structure of the major organic product Z?



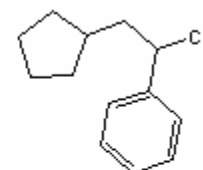
a)



b)



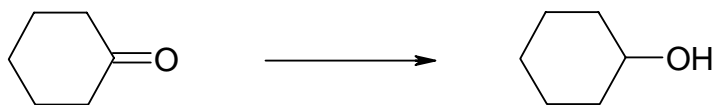
c)



d)

Ans: a)

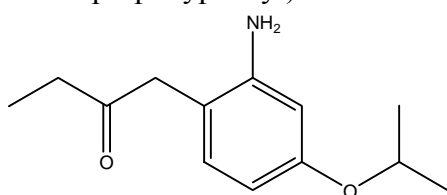
40. The conversion shown below may best described as which of the following types of reaction?



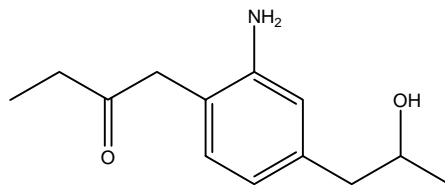
- (a) addition
- (b) substitution
- (c) reduction
- (d) addition and reduction

Ans: (c) : The carbonyl group is reduced to an alcohol. Reduction (text definition): a reaction that causes an increase of electron ownership by carbon.

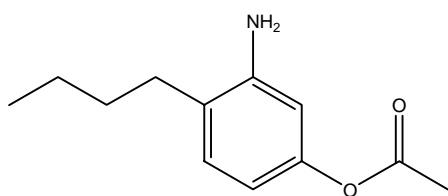
41. Which structure corresponds to the following chemical name: 1-(2-amino-4-isopropoxyphenyl)-2-butanone?



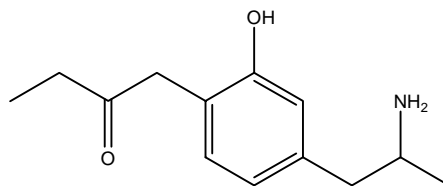
a)



b)



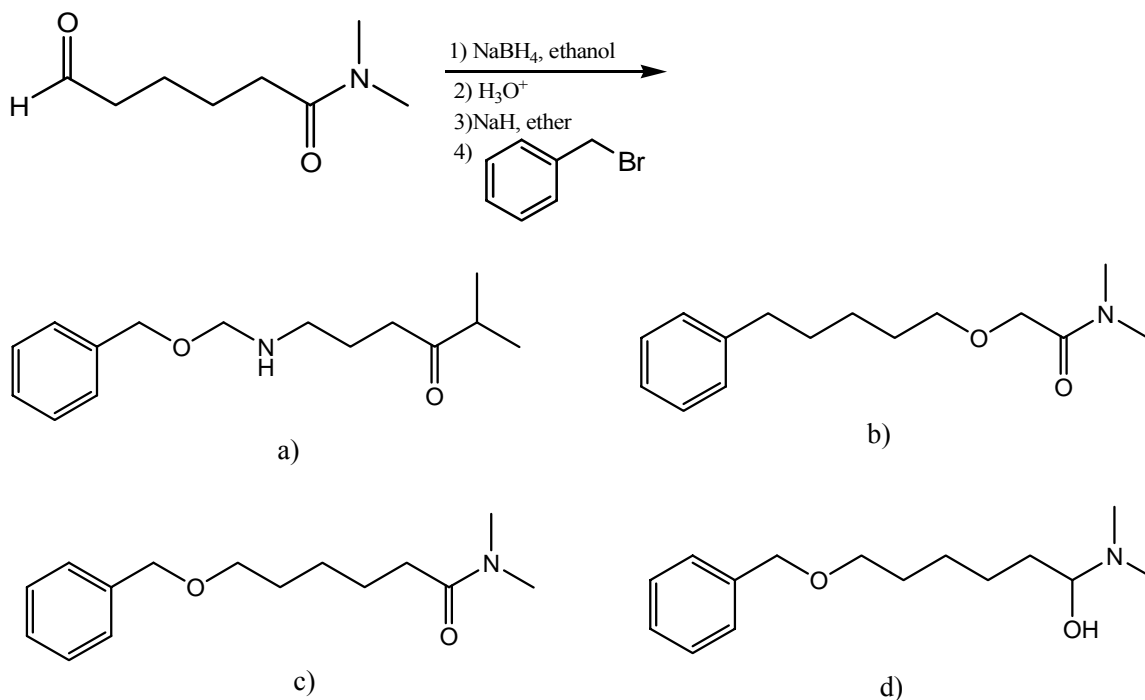
c)



d)

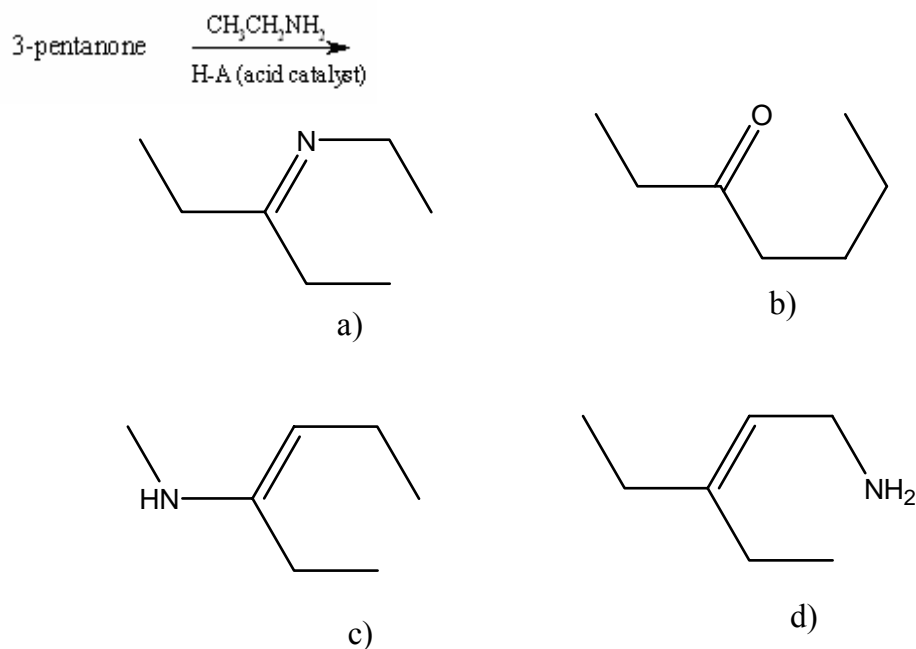
Ans: a)

41. What is the major product for the following reaction?



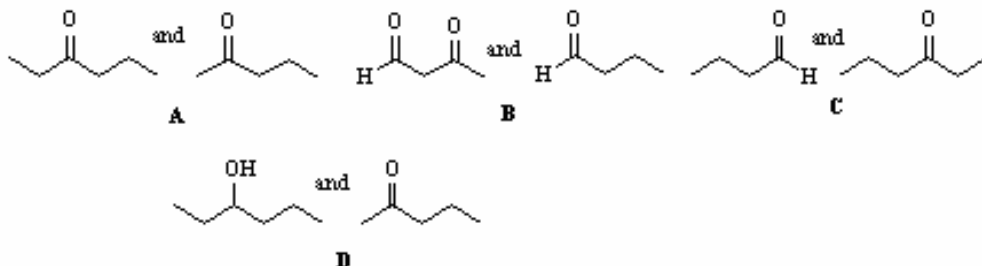
Ans: c)

43. What is the major product for the following reaction?



Ans: a)

44. The Tollen's test (silver mirror test) can be used to distinguish between which pair of compounds?



Ans: C Tollen's test used to differentiate between aldehydes + ketones. Tollen's reagent will oxidize aldehydes to carboxylic acids and form a "silver mirror", while ketones will show no reaction.

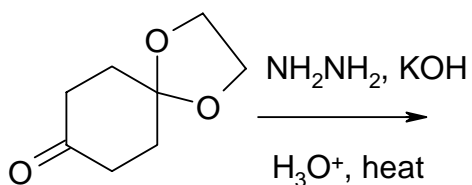
Therefore C is correct

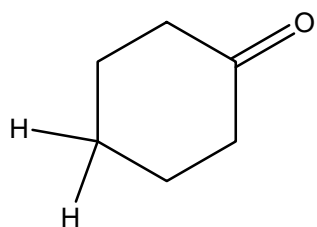
A: both ketones

B: both have aldehyde functional group

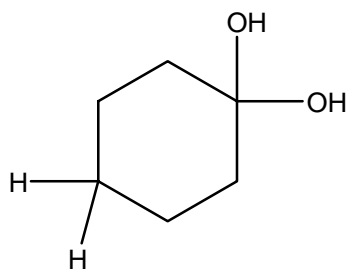
D: no aldehydes present

45. What is the predicted product of the following reaction sequence?

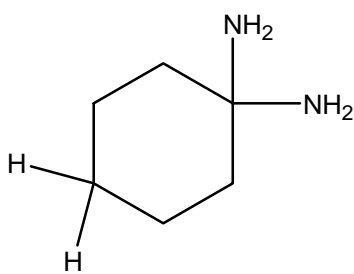




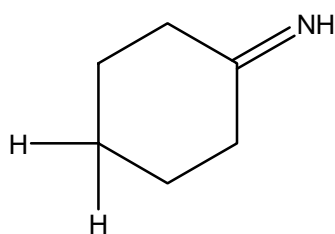
a)



b)

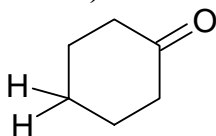


c)

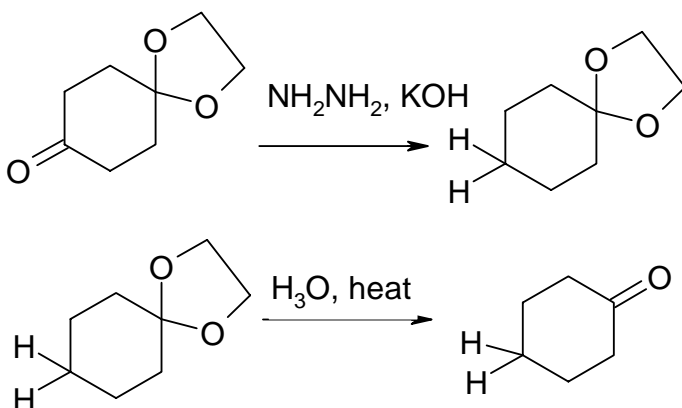


d)

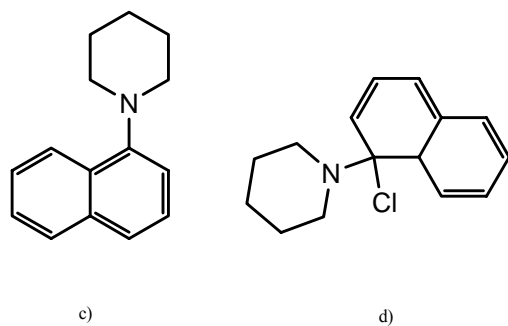
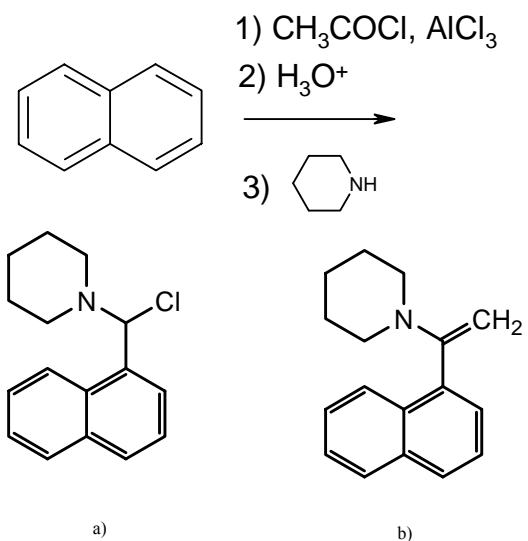
Ans: a)



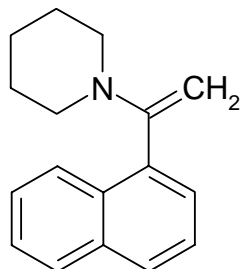
The first step in this scheme is a Wolf-Kishner reaction. The second step is the removal of the acetal protecting group to regenerate the ketone.



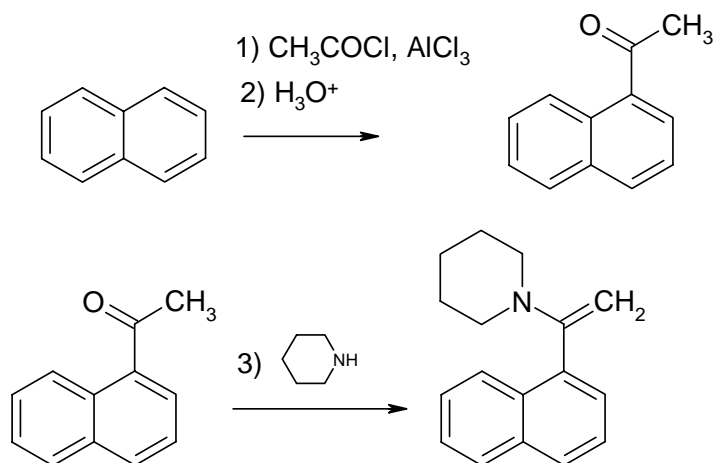
46. What is the predicted product of the following reaction sequence?



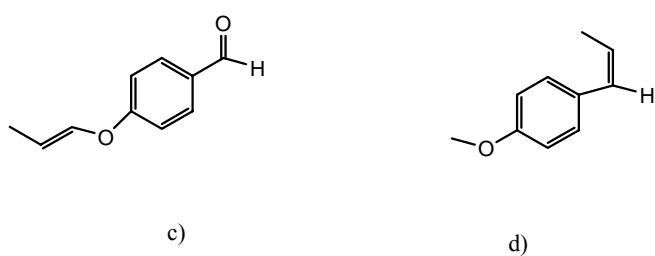
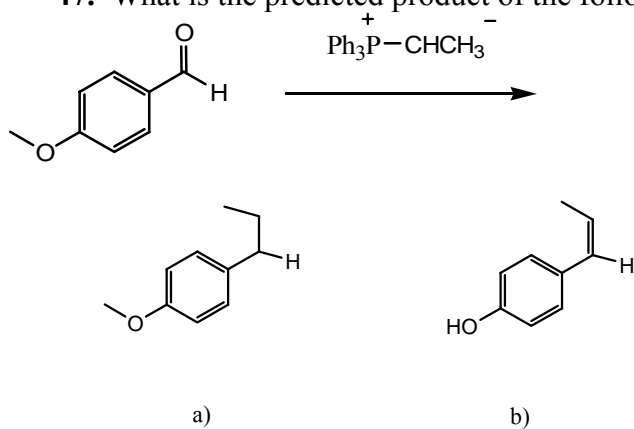
Ans: b)



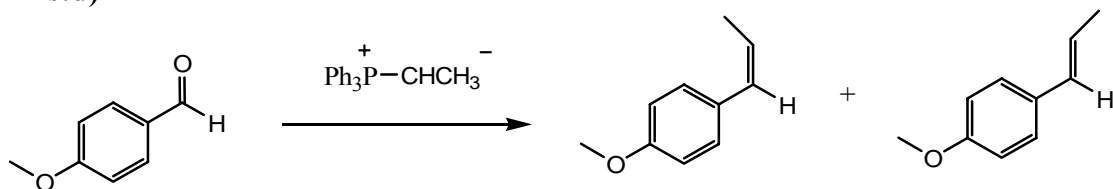
The first step is a Friedel-Crafts acylation. The second step generates an enamine.



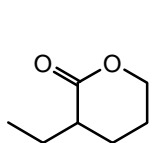
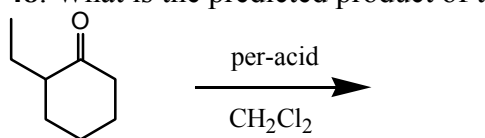
47. What is the predicted product of the following reaction sequence?



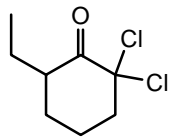
Ans:d)



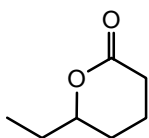
48. What is the predicted product of the following reaction scheme?



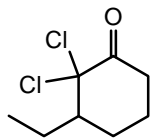
a)



b)



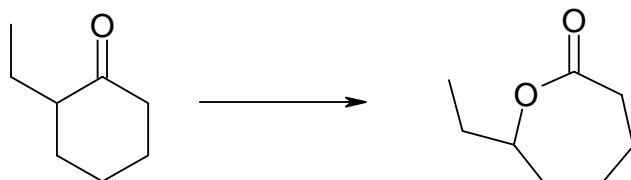
c)



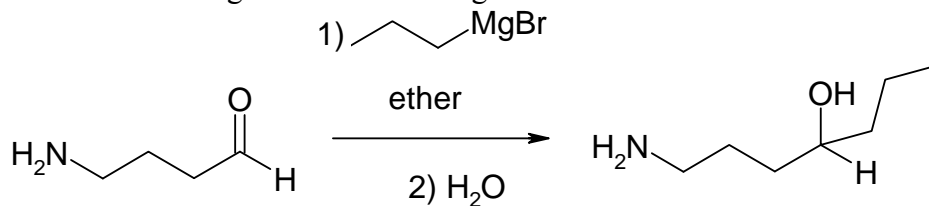
d)

Ans: c)

The oxygen should migrate to the more substituted side of the ketone.



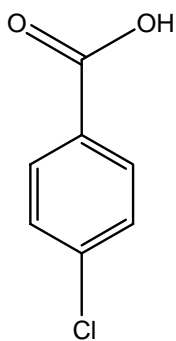
49. What is wrong with the following reaction scheme?



- The Grignard reagent will deprotonate the amine group, instead of attacking the carbonyl group.
- The Grignard reagent will deprotonate the aldehyde, instead of attacking the carbonyl group.
- The amine will be hydrolyzed off.
- Nothing. The scheme shown above is correct.

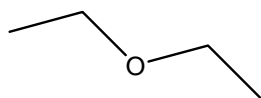
Ans: a) The Grignard reagent will deprotonate the amine group, instead of attacking the carbonyl group.

50. Of the following compounds, which will NOT be deprotonated by sodium methoxide (NaOCH_3)?

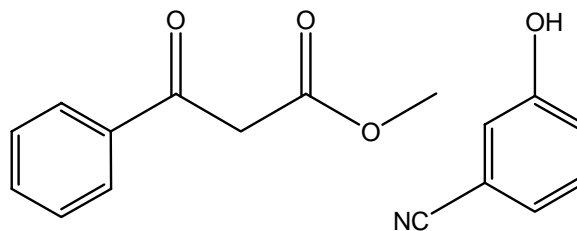


a)

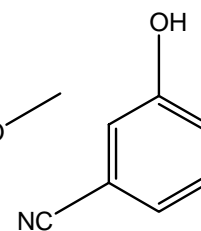
Ans: b)



b)

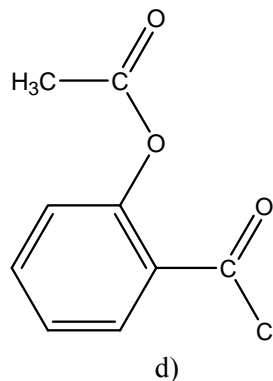
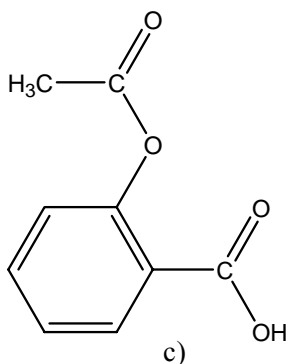
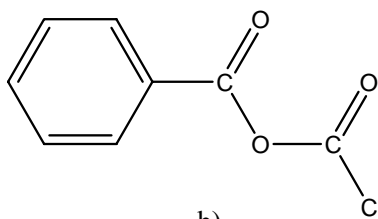
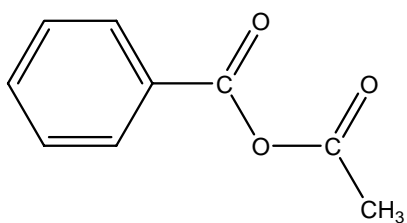
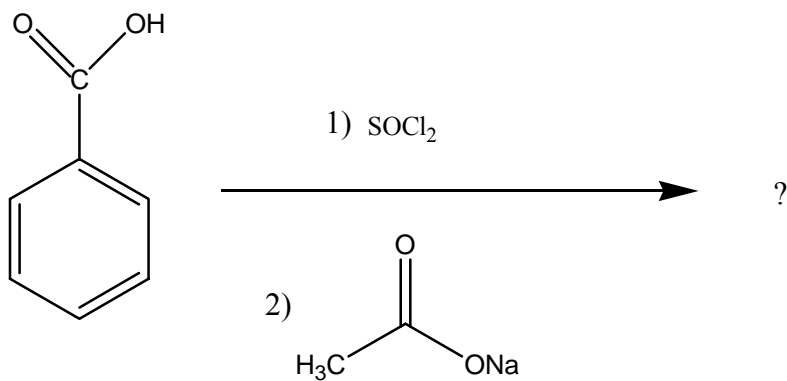


c)

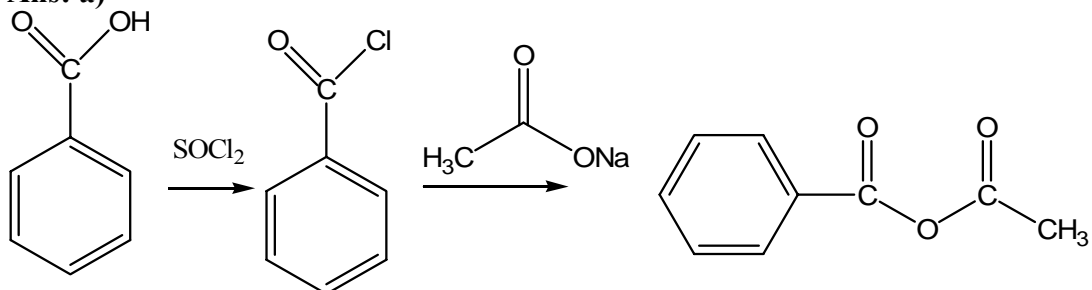


d)

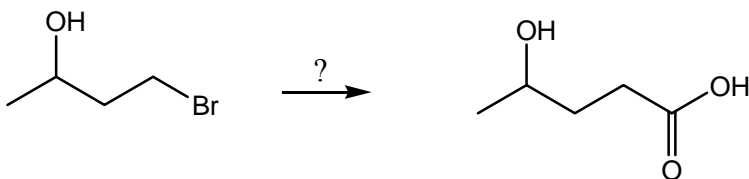
51. What is the predicted product of the following reaction scheme?



Ans: a)



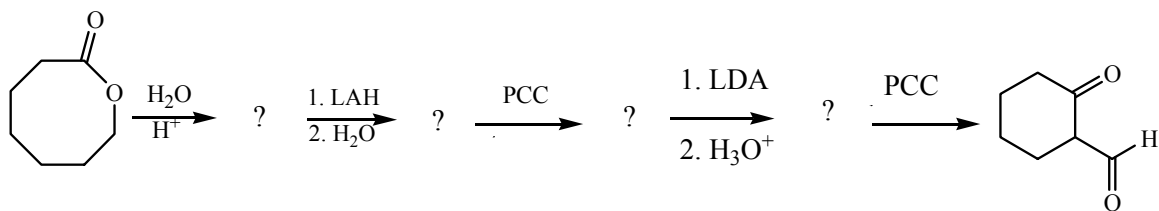
52. What are the necessary reagents and reaction conditions needed undertake the following functional group transformation (more than one step may be required)?



- a) 1) $\text{CH}_3\text{CH}_2\text{CH}_2\text{MgBr}$, ether, 2) H_2O
 b) 1) SOCl_2 , 2) CH_3COONa
 c) H_2O , NaOH
 d) 1) NaCN , acetone, 2) H_3O^+ , Δ

Ans: d)

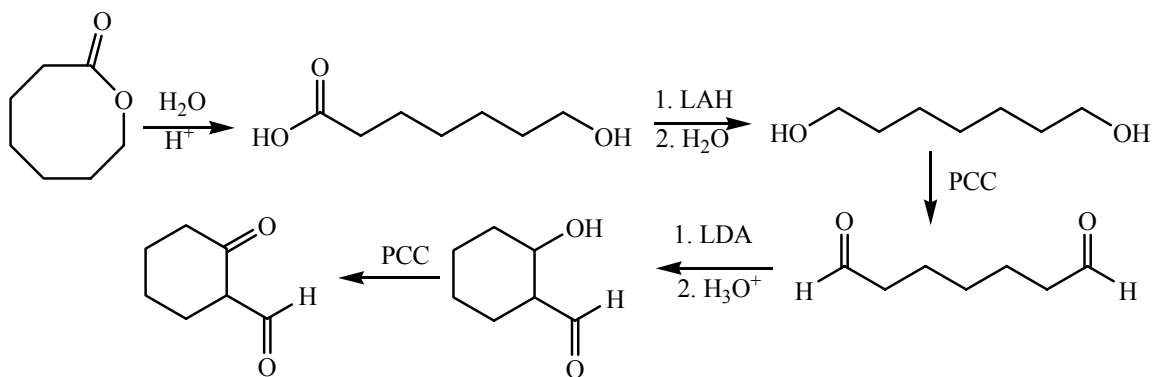
53. What is the order of the intermediates of the following reaction scheme?



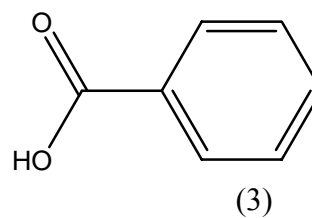
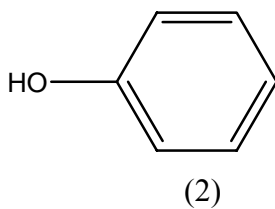
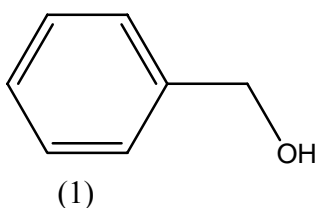
- I
- II
- III
- IV

- a) I, III, II, IV
 b) III, I, II, IV
 c) II, III, I, IV
 d) III, II, I, IV

Ans: c)



54. What is the order of decreasing acidity of the following benzene derivatives?

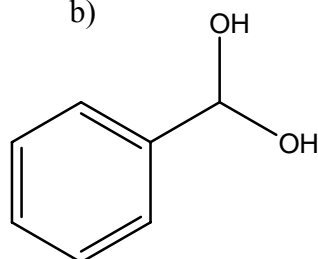
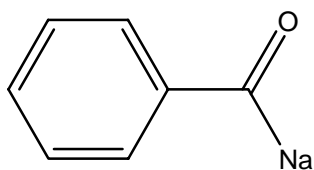
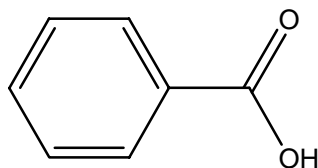
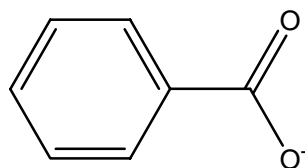
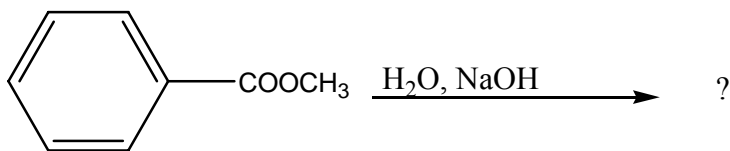


- a) (1)>(2)>(3)
- b) (3)>(2)>(1)
- c) (3)>(1)>(2)
- d) (2)>(3)>(1)

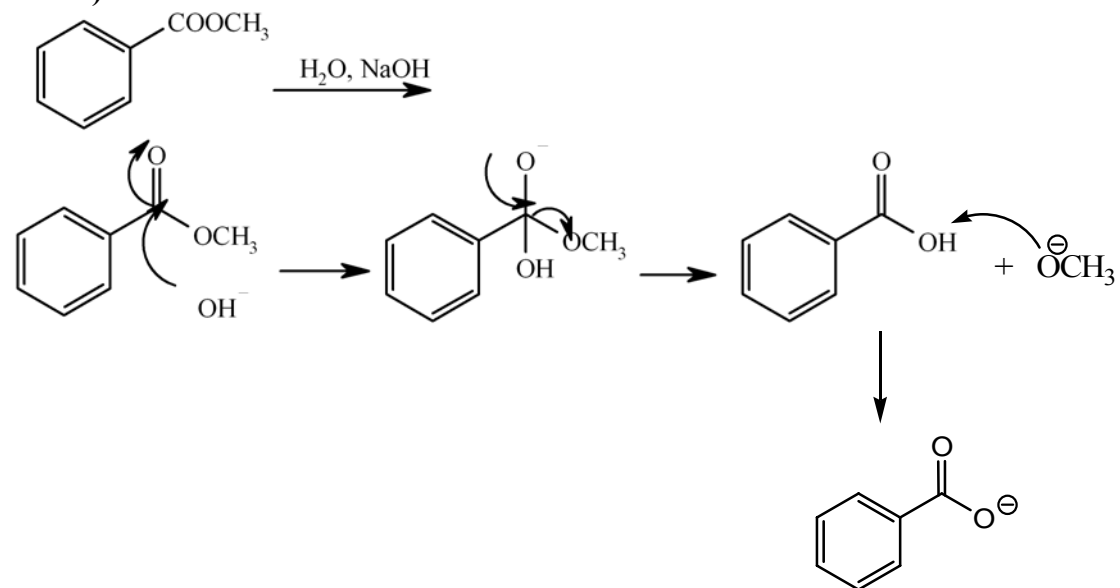
Ans: b)

pKa
 (1), ~17
 (2), ~10
 (3), ~4.75

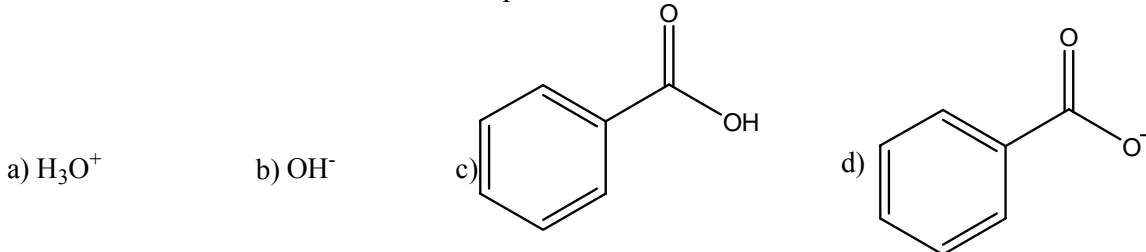
55. What is the predicted product of the following reaction scheme?



c)
Ans: a)



56. Equal molar amounts of benzoic acid and potassium hydroxide are dissolved in water. The most abundant of the four species below is.

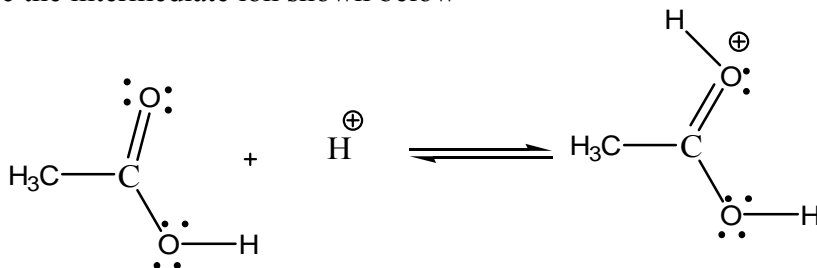


Ans: d)



This is neutralization.

57. In the esterification of acetic acid (ethanoic acid) with an alcohol (for example, with ethyl alcohol to give ethyl acetate (ethyl ethanoate) sulfuric acid can act as a catalyst to give the intermediate ion shown below



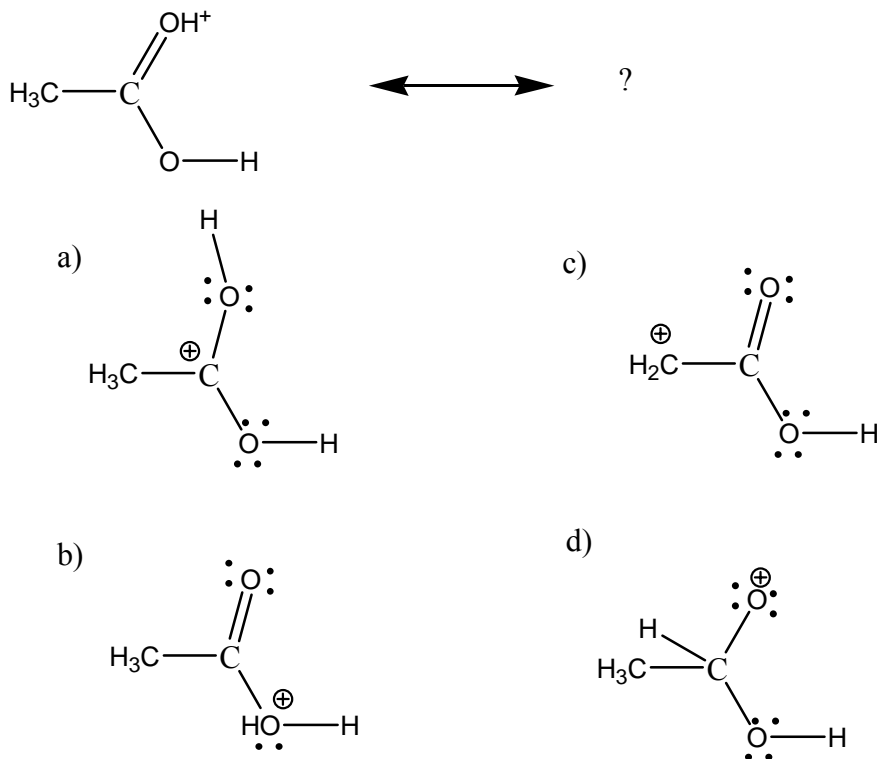
In this reaction, the acetic acid is behaving as

- a) an acid
- b) a base
- c) a carbocation
- d) an alcohol

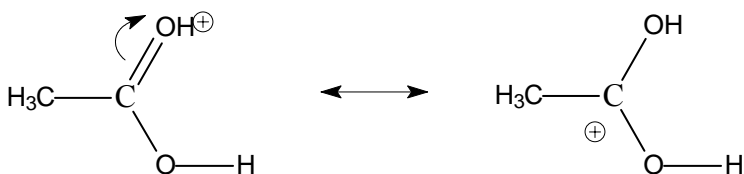
Ans: b)

Since the acetic acid accept a proton, it is behaving as a base by definition

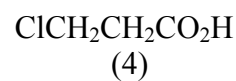
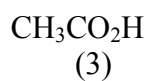
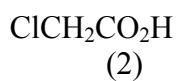
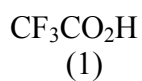
58. Another resonance form of the following ion is



Ans: a)



59. The order of decreasing acidity (i.e. the most acidic first) of the carboxylic acids (1)-(4) below is

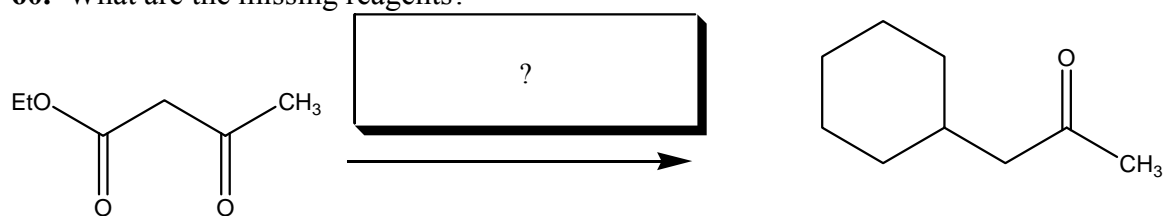


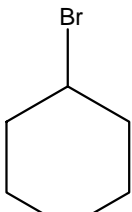
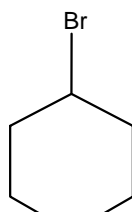
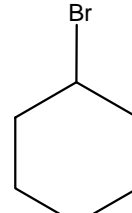
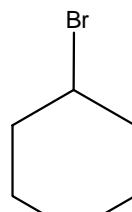
- a) (1)>(2)>(4)>(3)
 b) (3)>(1)>(2)>(4)
 c) (4)>(1)>(2)>(3)
 d) (2)>(1)>(4)>(3)

Ans: a)

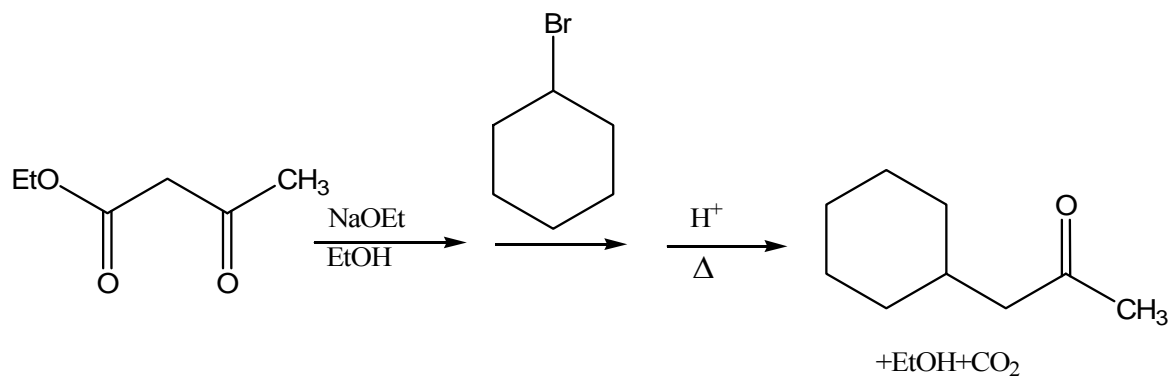
The acidity depends on the number and location of strong electron withdrawing groups. In (1), the group is closer than (2), and (2) closer than (4); in (3), there's no such a group.

60. What are the missing reagents?

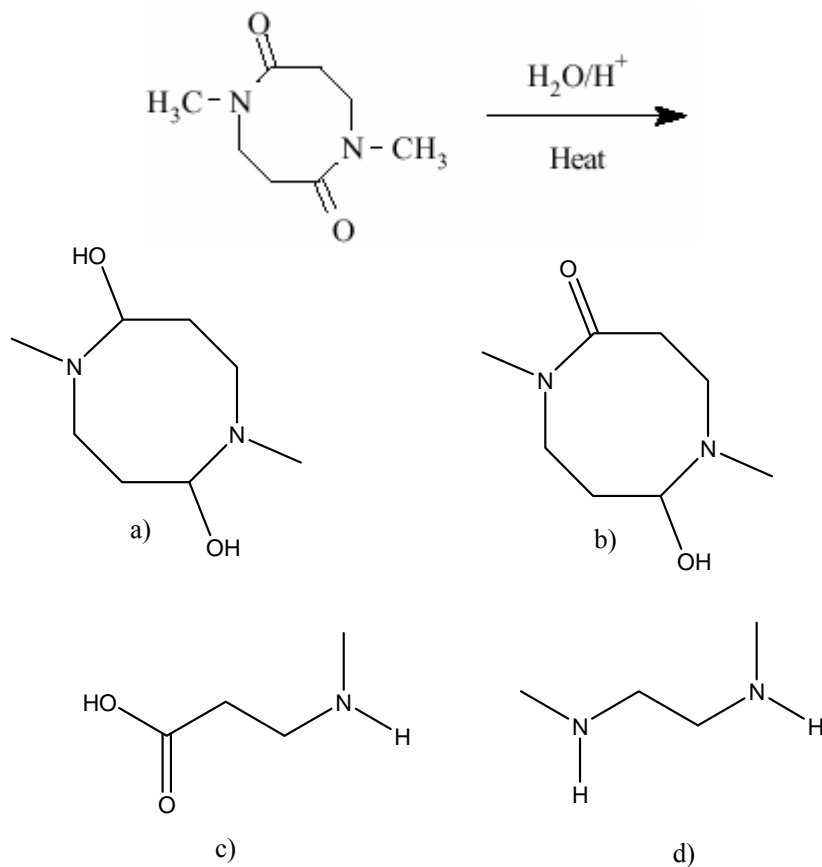


- a) 1) $\text{H}_2\text{O}/\text{H}^+$, Δ 2) 
- b) 1) NaOEt , EtOH 2)  3) H^+ , Δ
- c) 1) $\text{H}_2\text{O}/\text{OH}^-$ 2)  3) H^+ , Δ
- d) 1) NaBH_3 , Δ 2) 

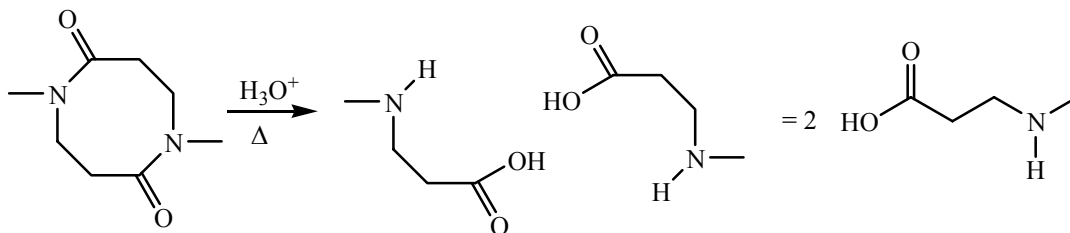
Ans: b)



61. What is the major organic product formed in the following reaction?

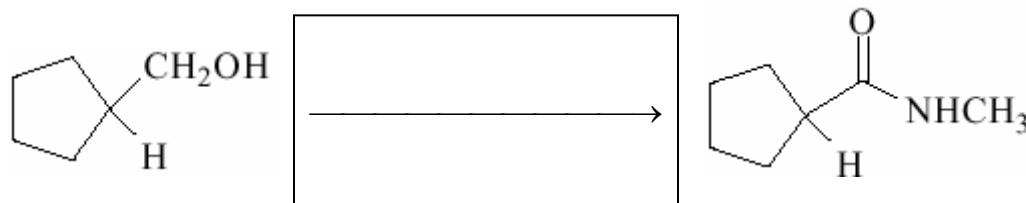


Ans: c)



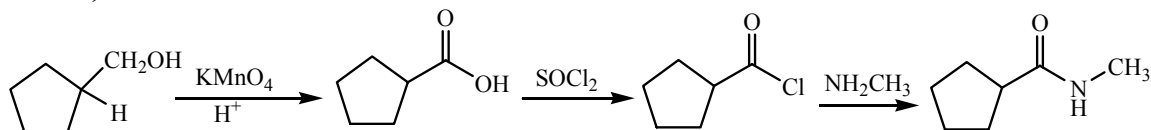
Both amides undergo hydrolysis.

62. What are the missing reagents?



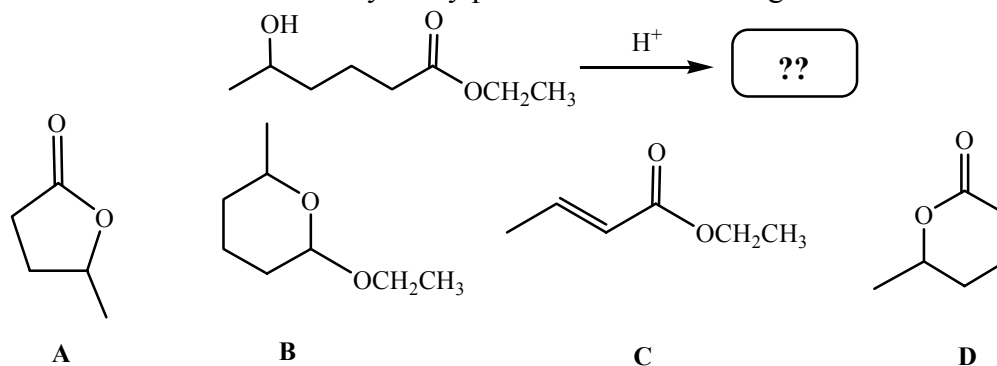
- a) 1) H_3O^+ , 2) NH_2CH_3
- b) 1) OH^- , 2) NH_2CH_3
- c) 1) KMnO_4 , H^+ , 2) H_2SO_4 , 3) NH_2CH_3
- d) 1) KMnO_4 , H^+ , 2) SOCl_2 , 3) NH_2CH_3

Ans: d)

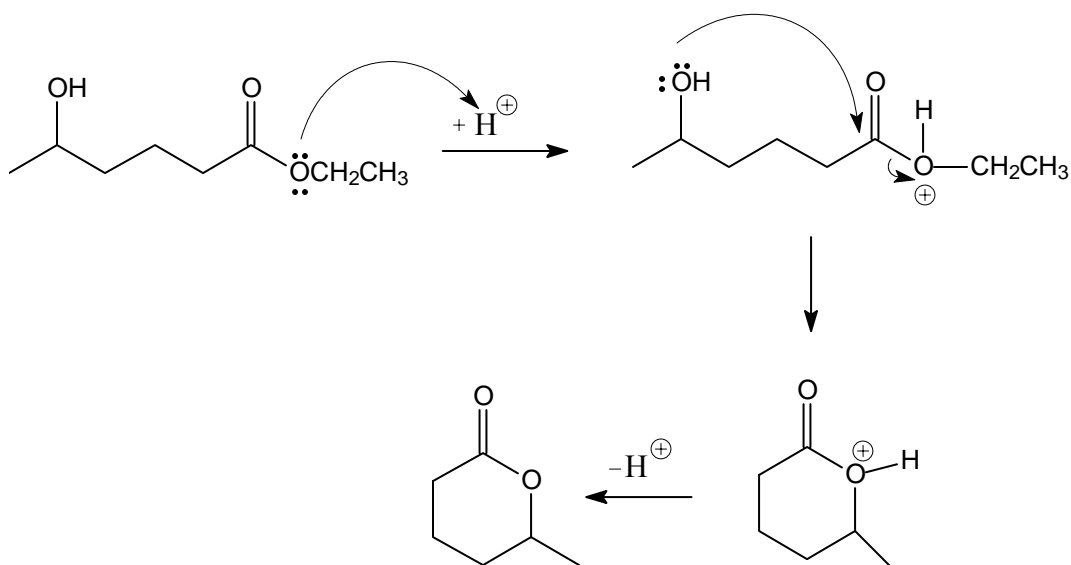


Vigorous oxidation of primary alcohols yields a carboxylic acid.

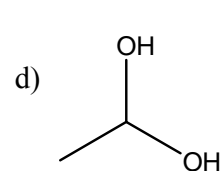
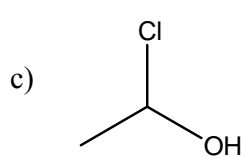
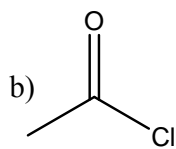
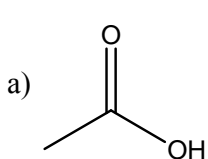
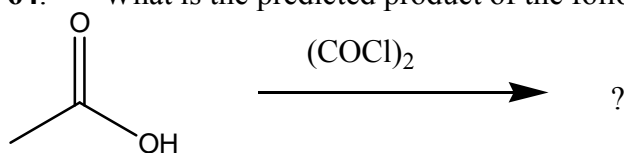
63. Which of A-D is the most likely product of the following reaction?



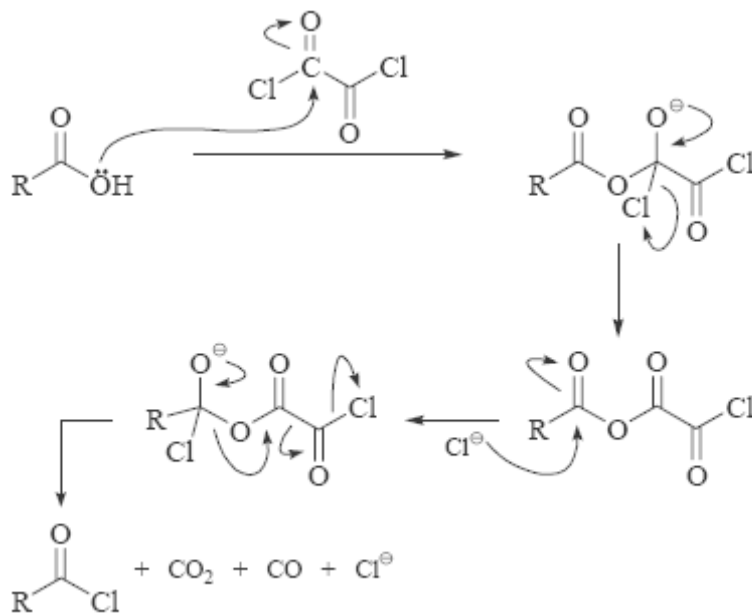
Ans: D



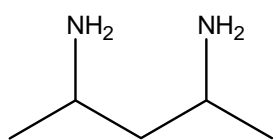
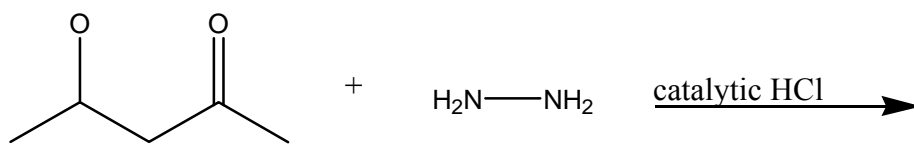
64. What is the predicted product of the following reaction?



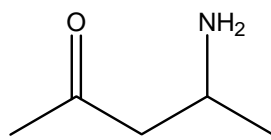
Ans: b



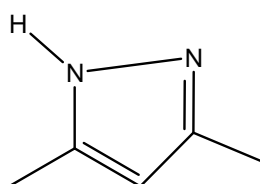
65. What is the predicted product of the following reaction?



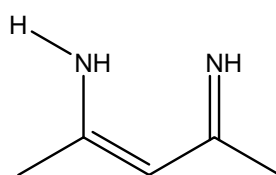
a)



b)

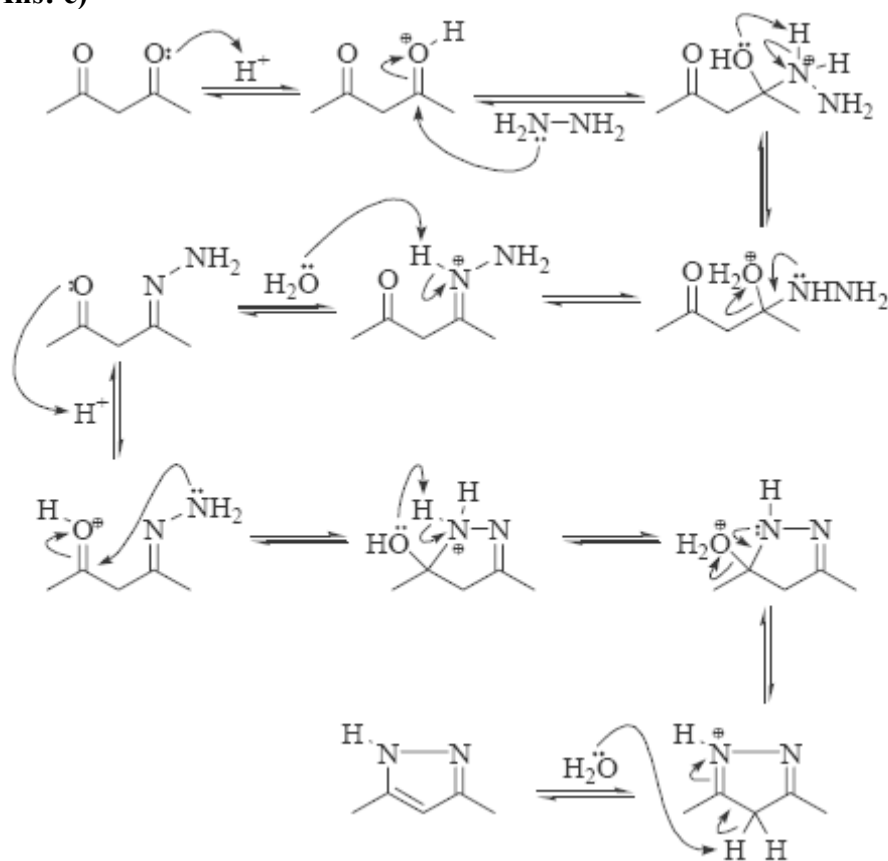


c)

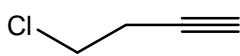


d)

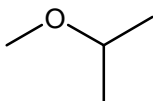
Ans: c)



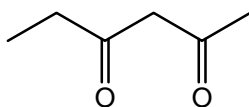
66. Of the following compounds, which ones that can be deprotonated by sodium ethoxide (NaOC_2H_5) to form a monoanionic species?



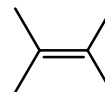
a)



b)

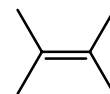
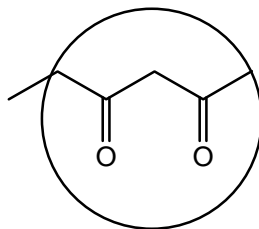
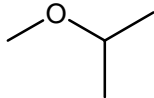
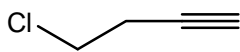


c)

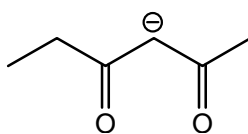


d)

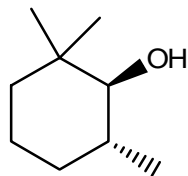
Ans: c)



will form



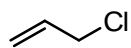
67. What is the major products of the following reaction?



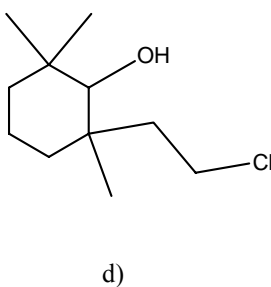
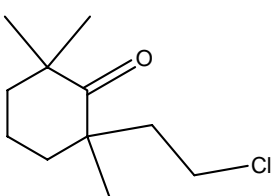
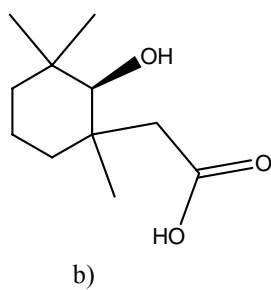
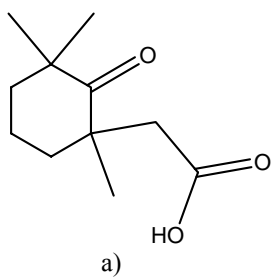
1) $\text{CrO}_3, \text{H}_3\text{O}^+$, acetone

2) LDA, ether

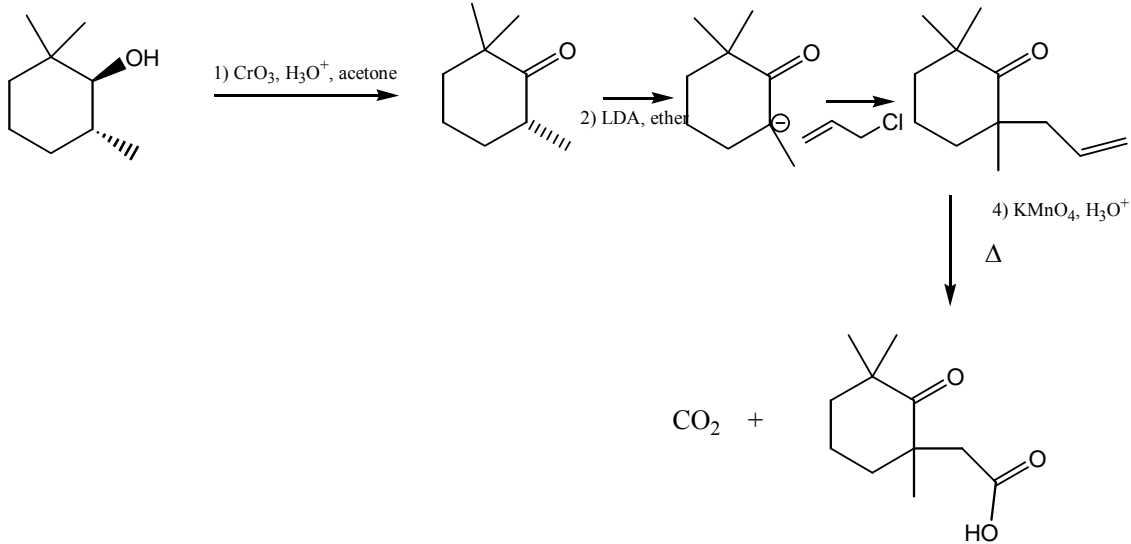
3)



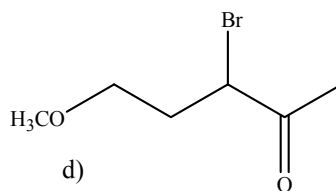
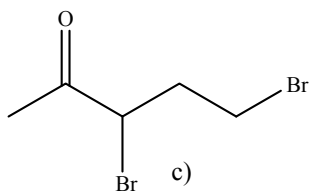
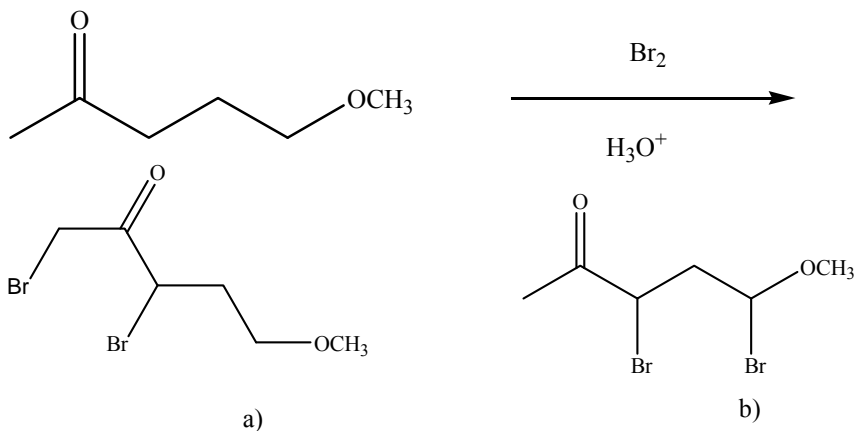
4) $\text{KMnO}_4, \text{H}_3\text{O}^+ \Delta$



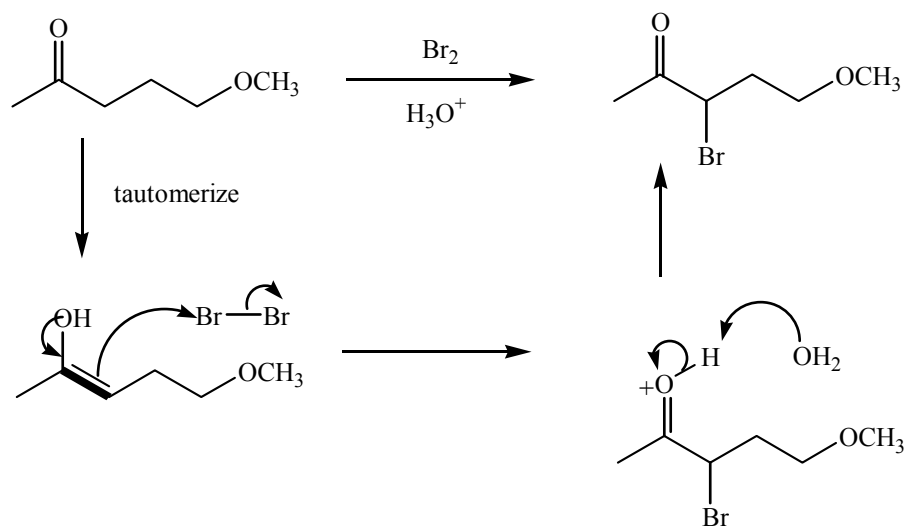
c) **Ans: a)**



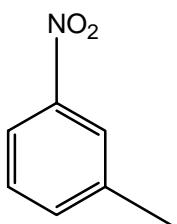
68. What is the product of the following reaction?



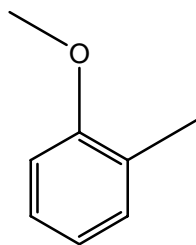
Ans: d)



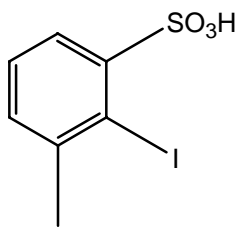
69. Of the following species, which one can react with an aromatic diazonium ion to form an azo dye?



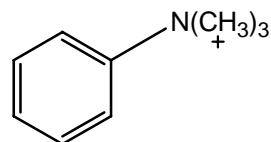
a)



b)



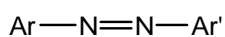
c)



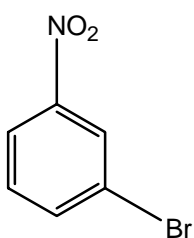
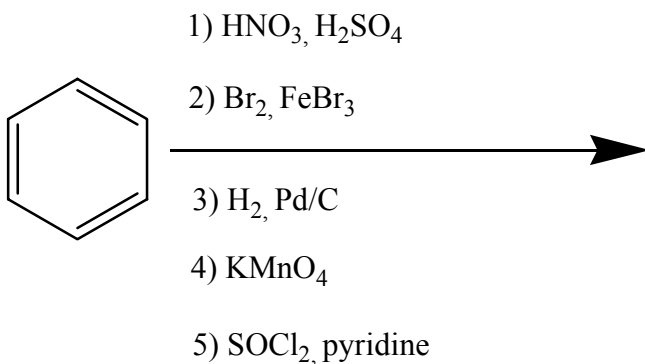
d)

Ans: b)

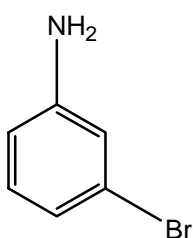
recall: arenediazonium salts couple with activated aromatic rings to give azo compounds:



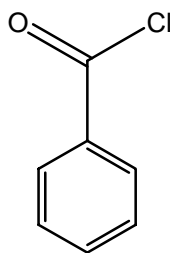
70. What is the product of the following reaction?



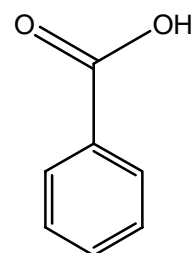
a)



b)

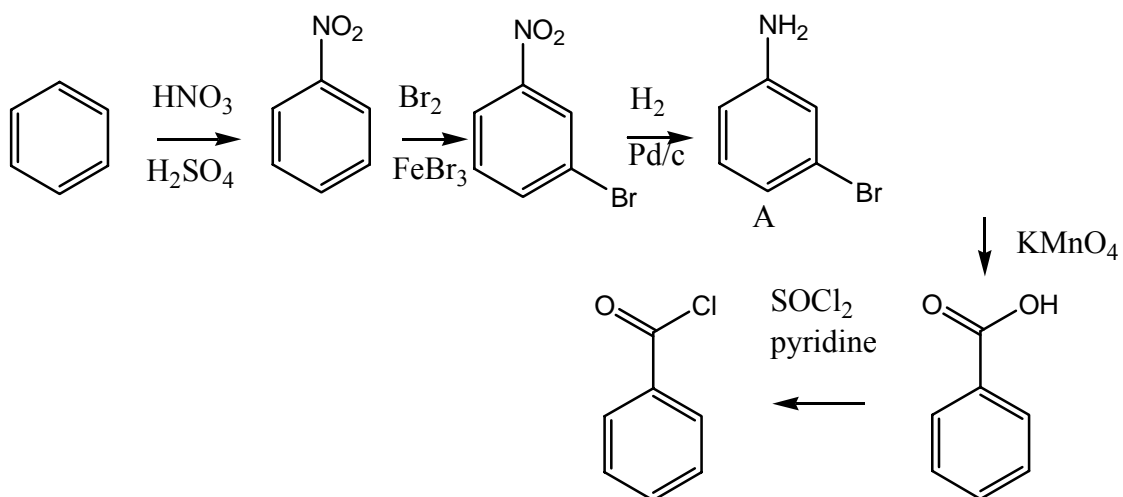


c)

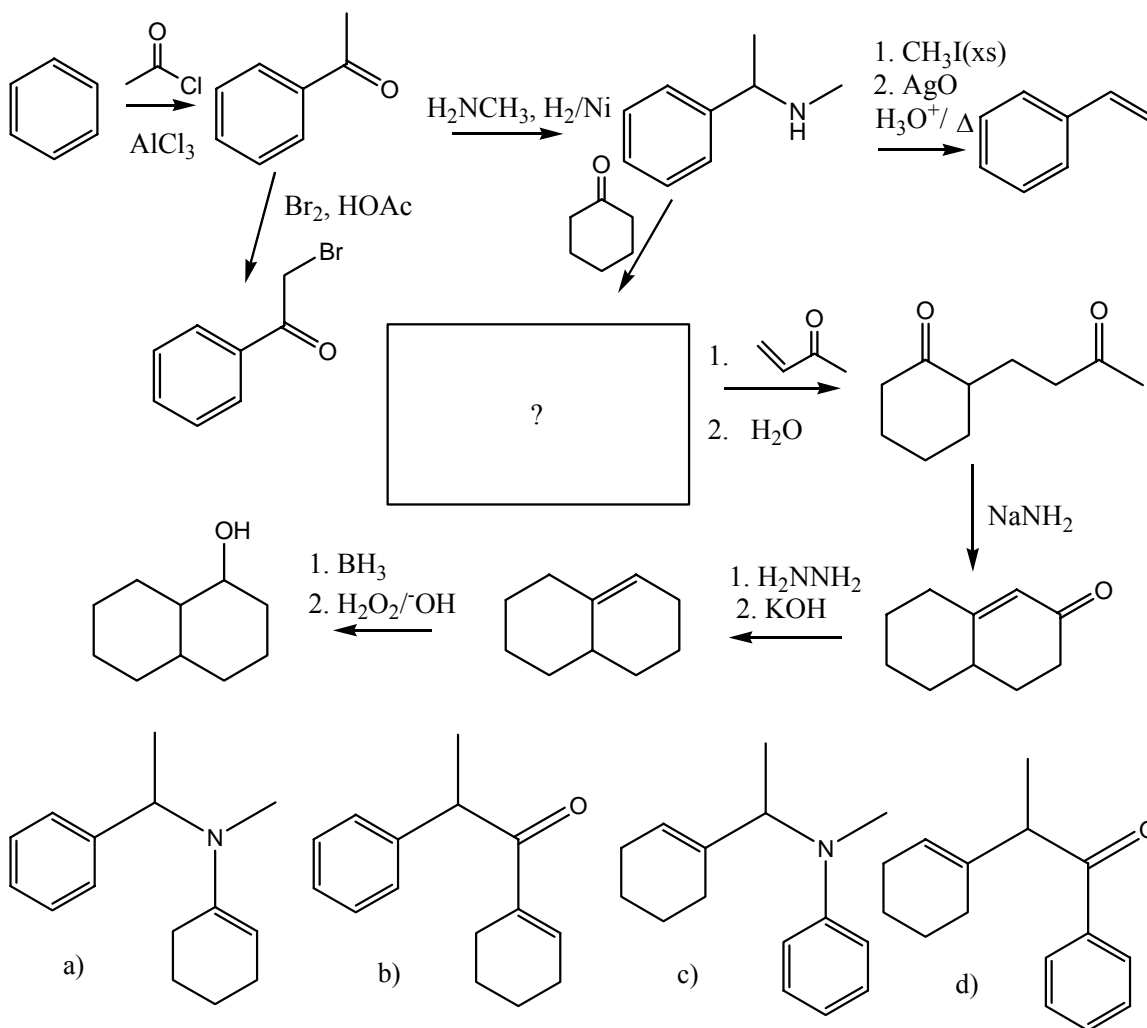


d)

Ans: c)

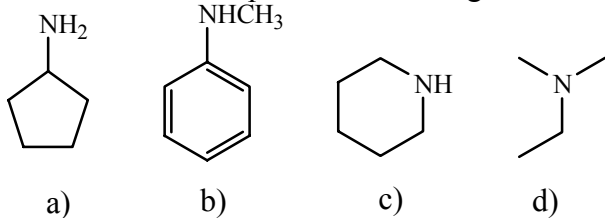


71. What is the missing intermediate in the following reaction?



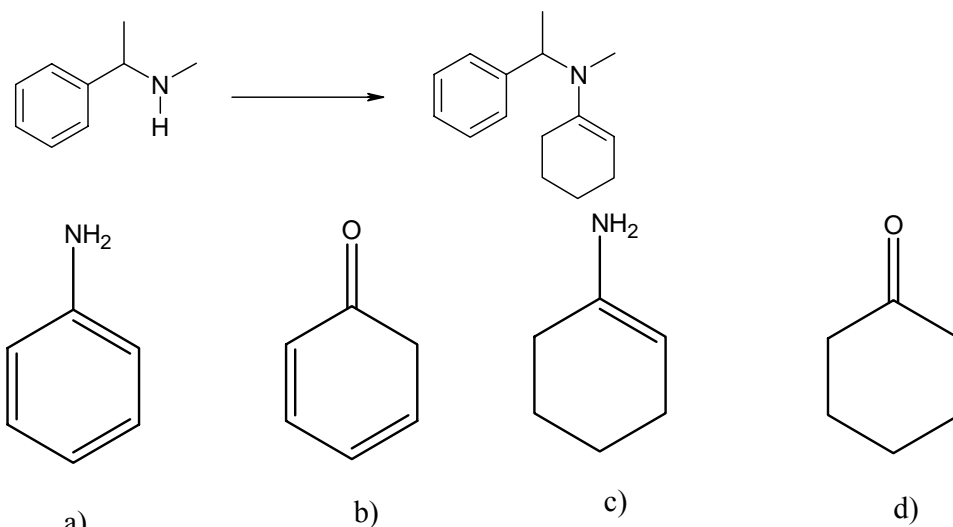
Ans: a)

72. Which compound will undergo diazotization?



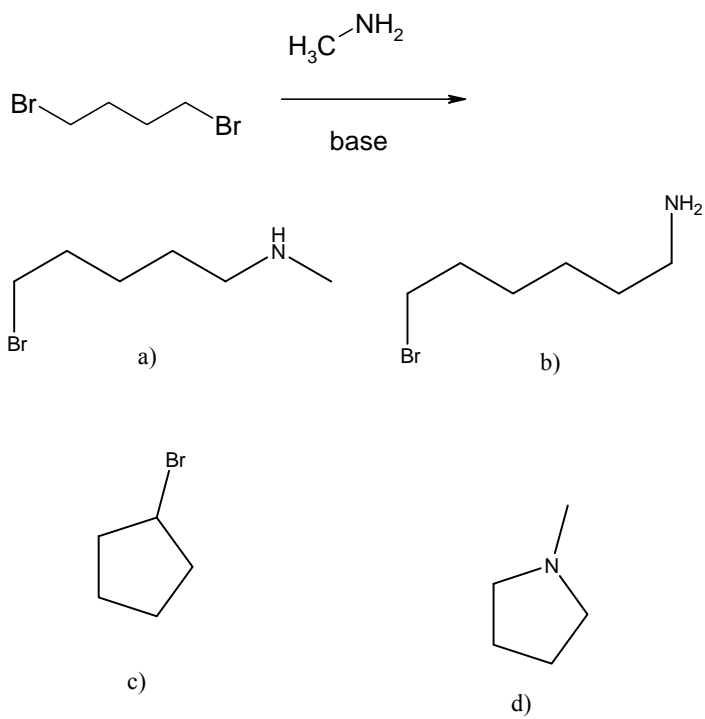
Ans. a)

73. What is the missing reagent in the following reaction?



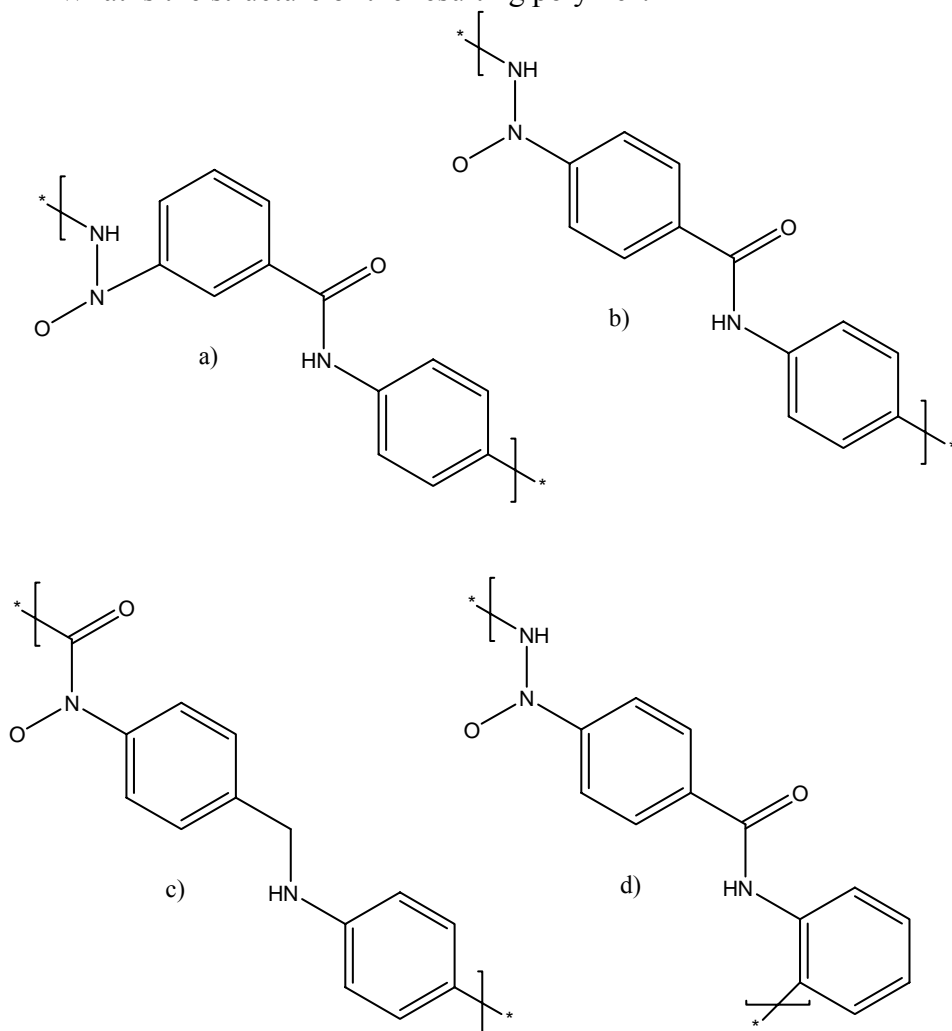
Ans: d)

74. What is the product of the following reaction?



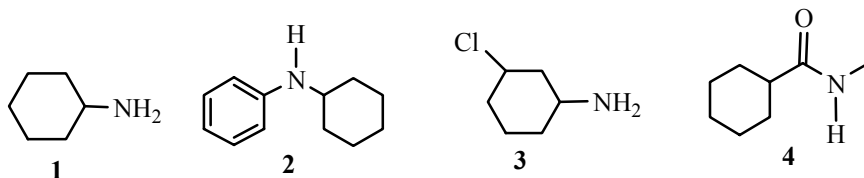
Ans: d)

75. Kevlar is formed by combining benzene-1,4-dicarboxylic acid with *p*-diamino-benzene. What is the structure of the resulting polymer?



Ans: b)

76. Which of A-D properly indicates which of the following molecules is the most basic and the least basic?

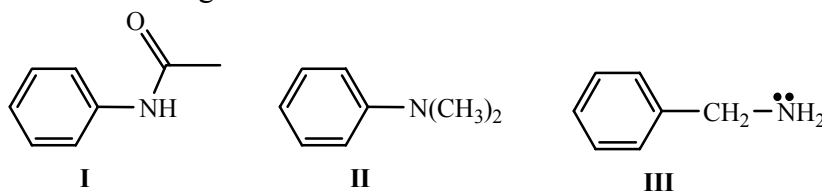


	Most Basic	Least Basic
A	1	4
B	2	3
C	3	2
D	4	1

Ans: A

1, Aliphatic amines >3, Aliphatic amines with Cl electron withdrawing group >2, aromatic amine > 4, conjugated with O

77. Which of A-D correctly ranks the following in order of increasing basicity, from weakest base to strongest?



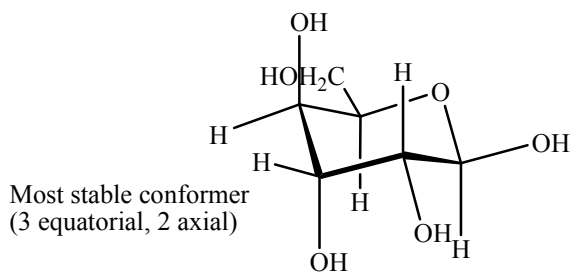
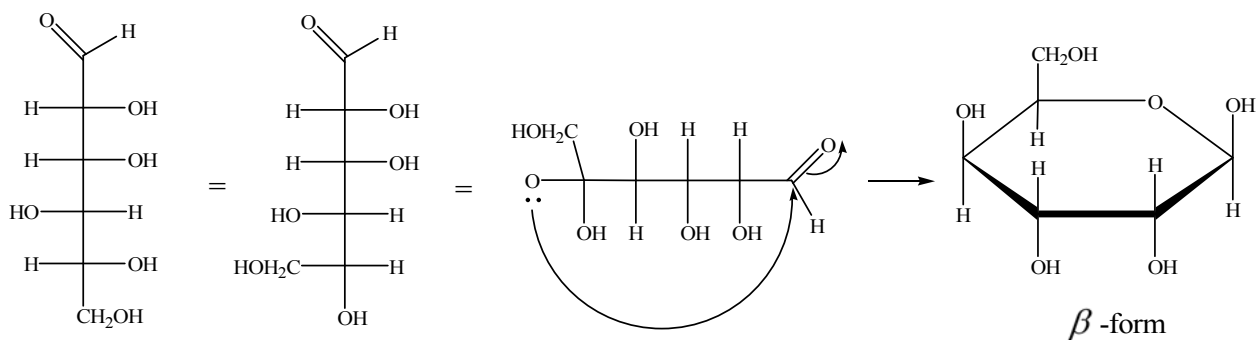
- A. I < II < III
 B. III < II < I
 C. II < III < I
 D. III < I < II

Ans: A

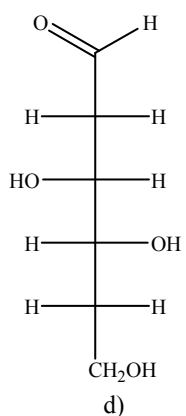
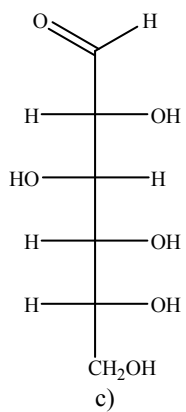
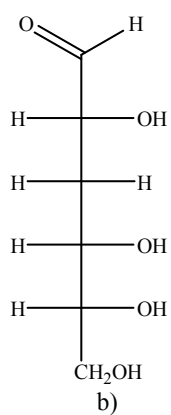
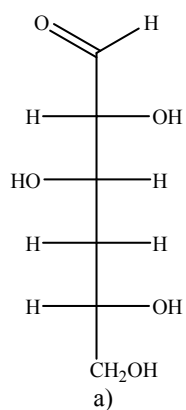
I has an aromatic ring and conjugated with O

II connected to an aromatic ring.

III is an aliphatic amine.

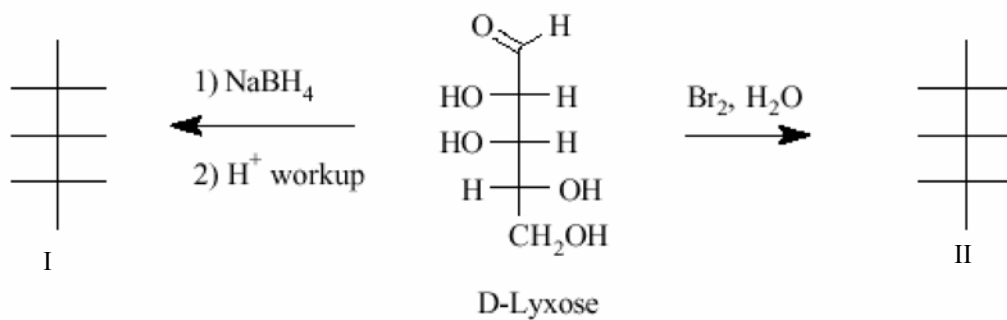


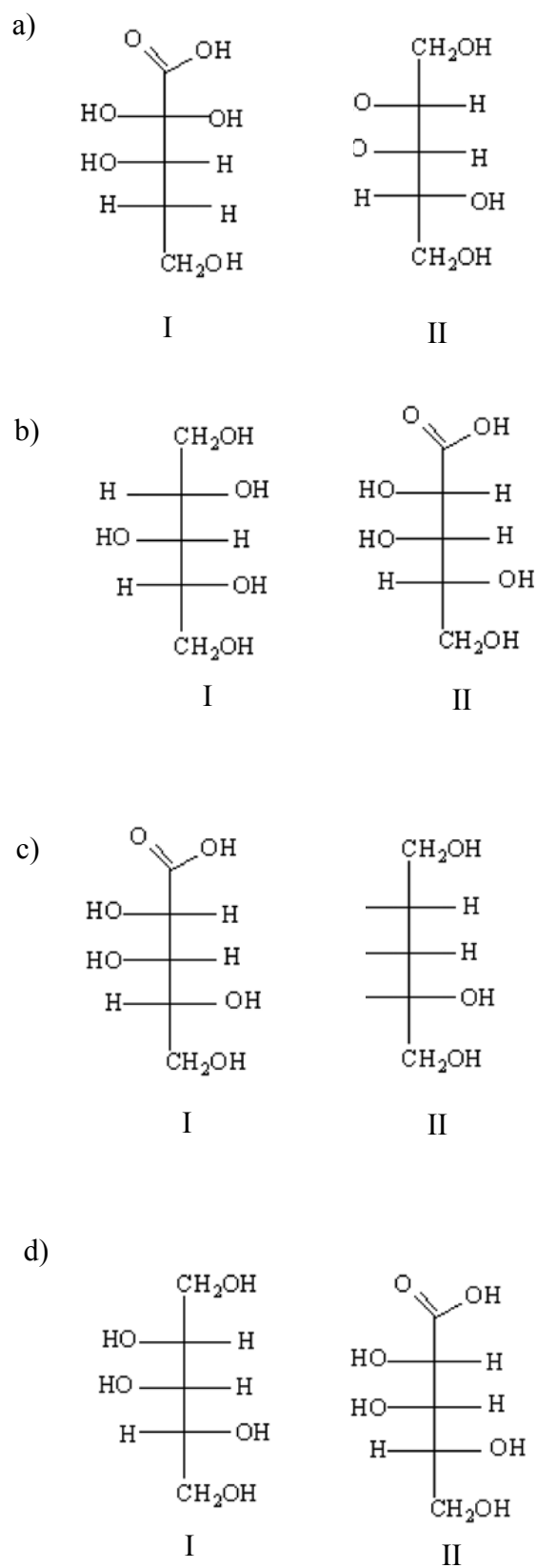
80. Which is the product when two aldoses are reduced with NaBH_4 ?



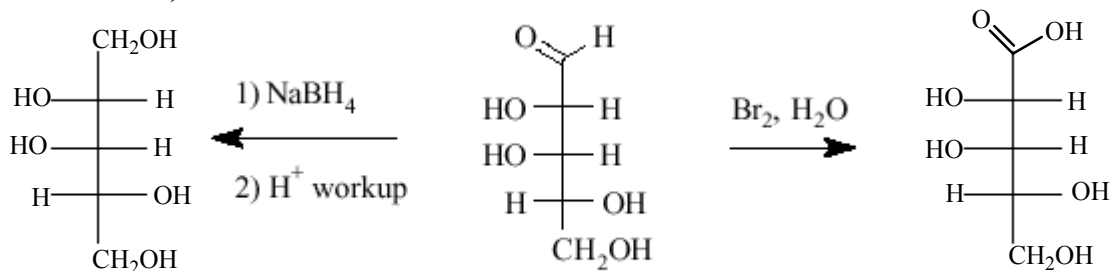
Ans: c)

81. What are the Fischer Projection formulas (I and II) for the compounds formed by the following two reactions of D-lyxose?



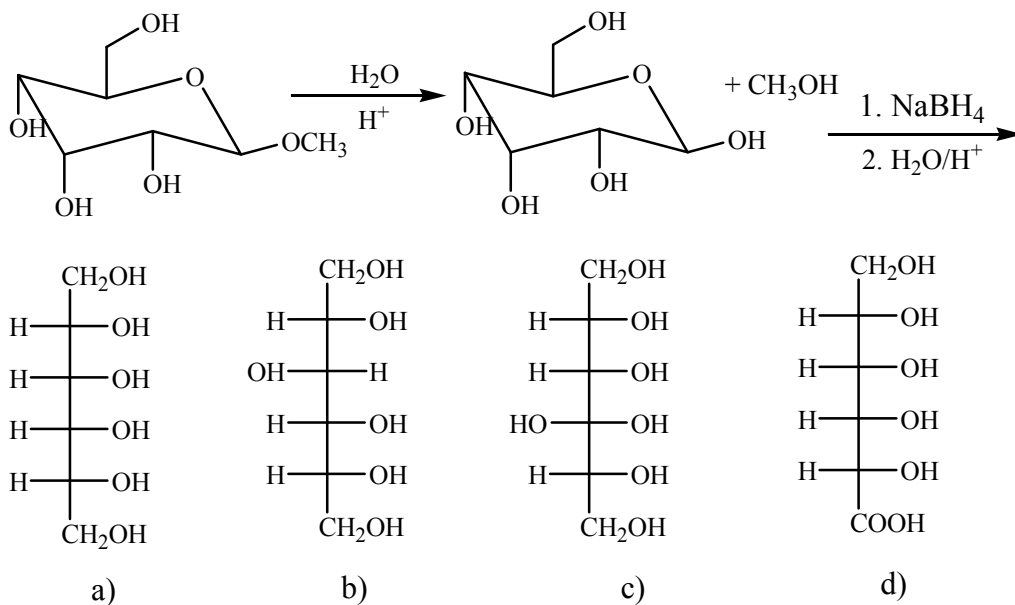


Ans: d)

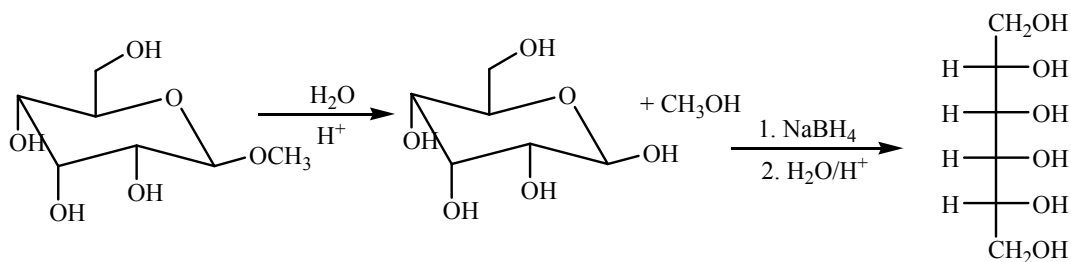


D-Lyxose

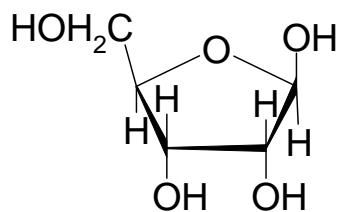
82. What is the product of the following reaction?



Ans: a)



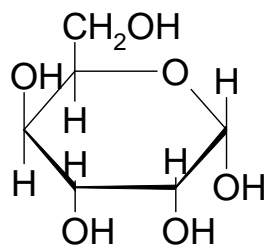
83. What is the systematic name for the following?



- a) Beta-D-ribofuranose
- b) Alpha-D-ribofuranose
- c) Beta-L-ribofuranose
- d) Alpha-L-ribofuranose

Ans: a)

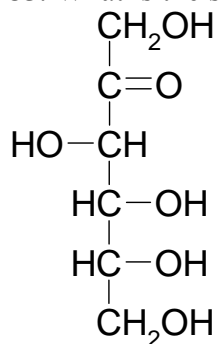
84. What is the systematic name for the following?



- a) Beta-D-gulopyranose
- b) Alpha-D-gulopyranose
- c) Beta-L-gulopyranose
- d) Alpha-L-gulopyranose

Ans: b)

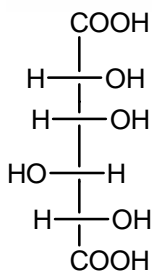
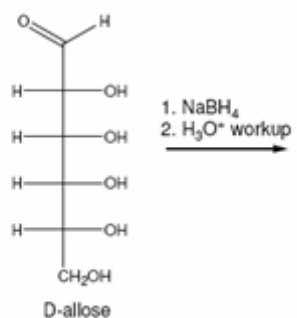
85. What is the systematic name for the following?



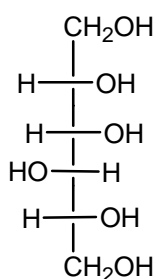
- a) L-glucose
- b) D-glucose
- c) L-fructose
- d) D-fructose

Ans: d)

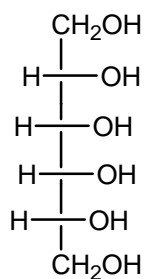
86. What is the product of the following reaction?



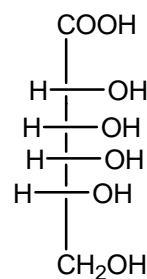
a)



b)



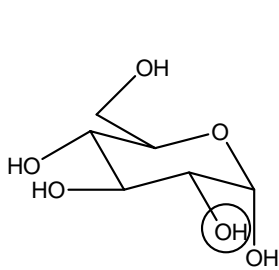
c)



d)

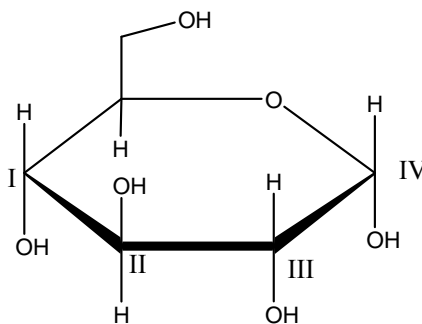
Ans: c)

87. The circled hydroxyl group in the top figure would be located in which position number in the bottom figure?

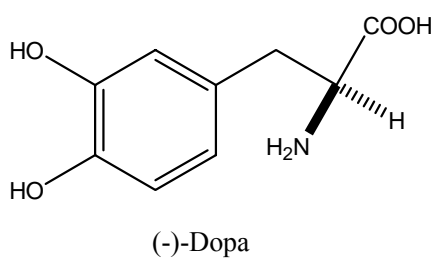
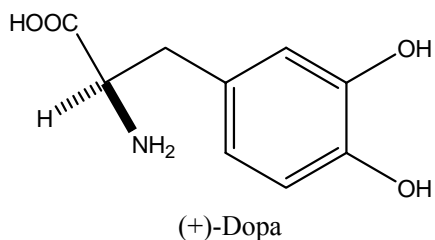


- a) I
- b) II
- c) III
- d) IV

Ans: c)



88. The absolute configuration of (+)-dopa is ____, and the absolute configuration of its enantiomer is ____:



- a) R, R
- b) R, S
- c) S, R
- d) S, S

Ans: b)

89. Naturally-occurring sugars may have which of the following configurations?

- I. D
- II. L
- III. α
- IV. β

- a) I only
- b) II only
- c) I and IV only
- d) I, II, III, and IV

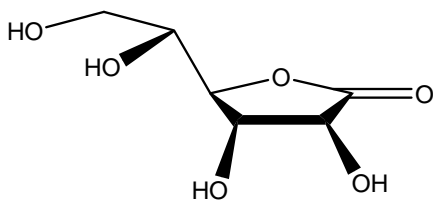
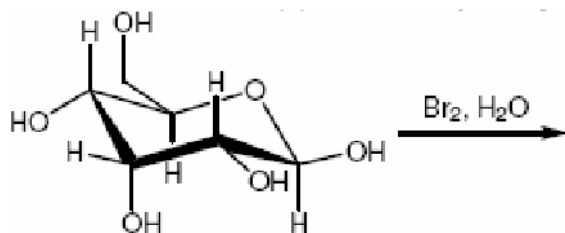
Ans: d)

90. How many chiral centres must a meso compound have?

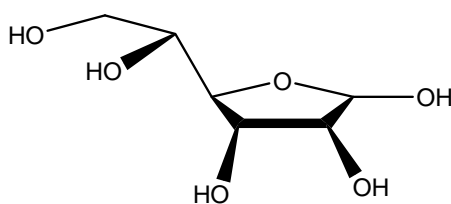
- a) 0
- b) 1
- c) 2
- d) Any even number greater than or equal to 2

Ans: c)

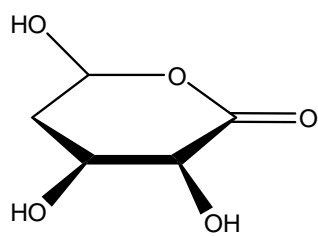
91. What is the major organic product of the reaction below?



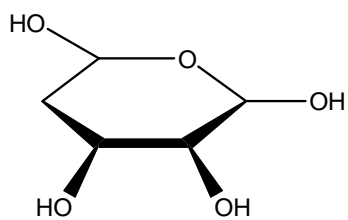
a)



b)



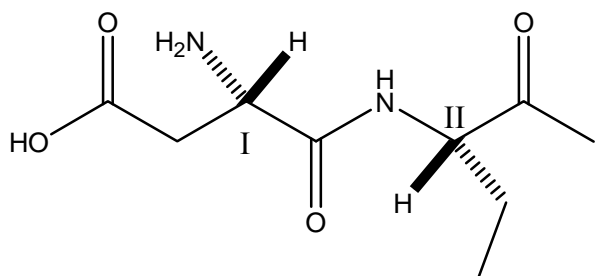
c)



d)

Ans: a)

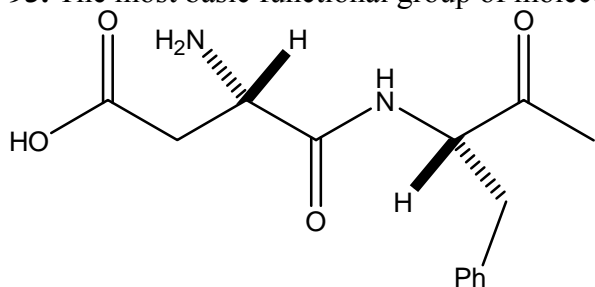
92. The absolute configurations of carbons I and II on the molecule below are, respectively:



- a) R and R
- b) R and S
- c) S and R
- d) S and S

Ans: d)

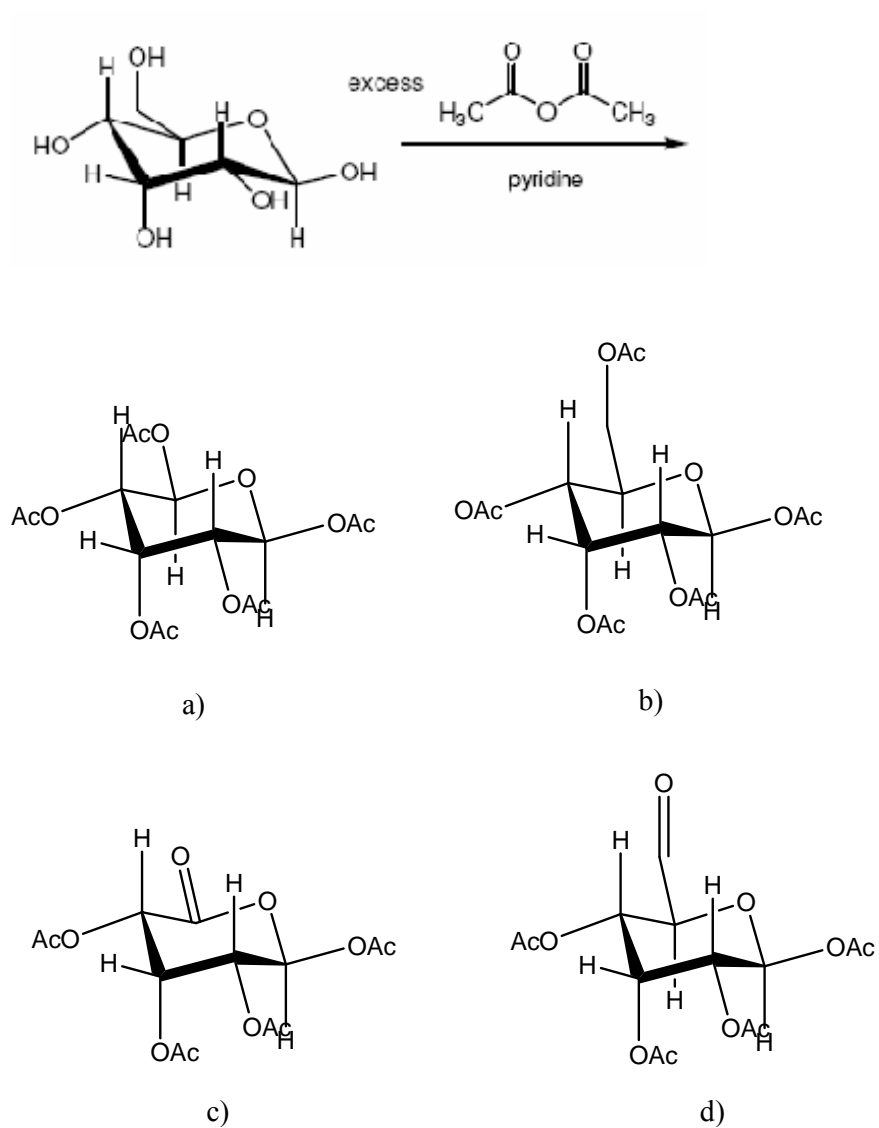
93. The most basic functional group of molecule below would be the:



- a) aromatic ring
- b) ester carbonyl oxygen
- c) amino group
- d) amide nitrogen

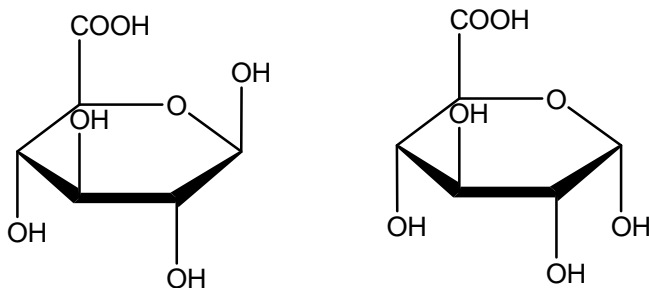
Ans: c)

94. What is the major organic product of the reaction below?



Ans: b)

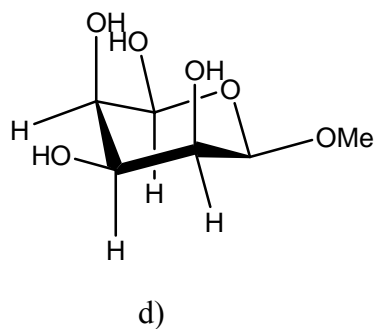
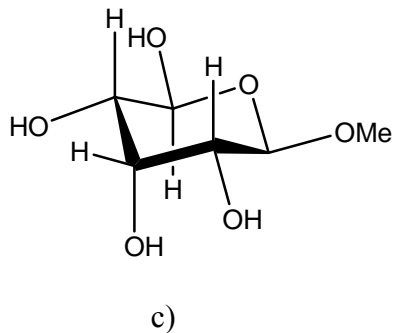
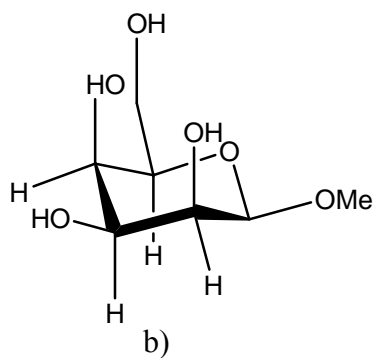
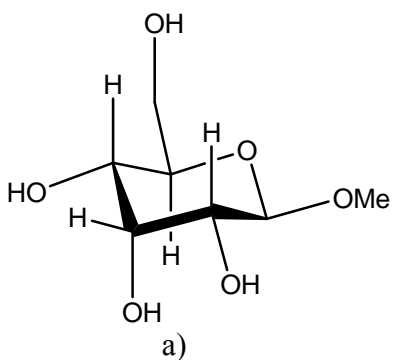
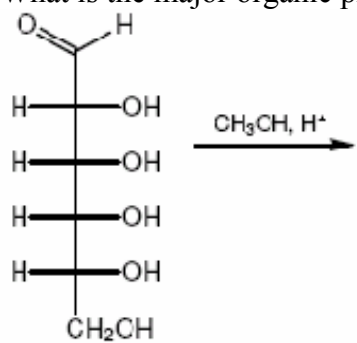
95. The two molecules may accurately be described by which of the following?



- I. Anomers
 - II. Diastereomers
 - III. Epimers
- a) I only
b) II only
c) I and III only
d) I, II, and III

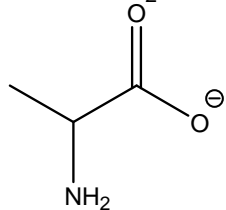
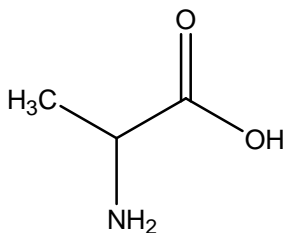
Ans: d)

96. What is the major organic product of the reaction below?

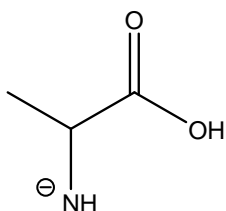


Ans: a)

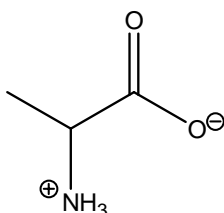
97. What is the zwitterionic form of the following amino acid?



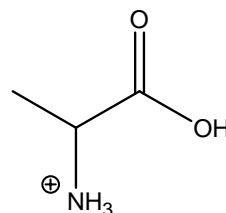
a)



b)



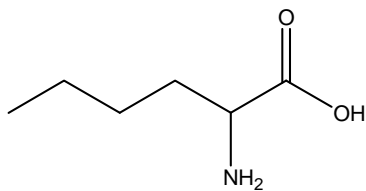
c)



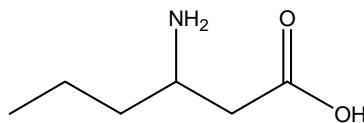
d)

Ans: c)

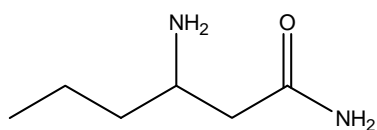
98. Which one of the following molecules would correctly be called an α -amino acid?



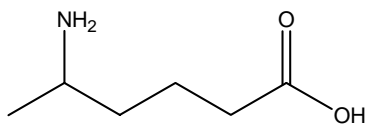
a)



b)



c)



d)

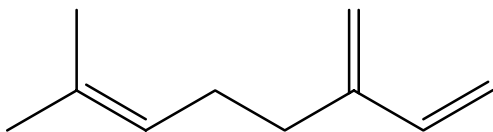
Ans: a)

99. Which of the following fatty acids will be liquids at room temperature?

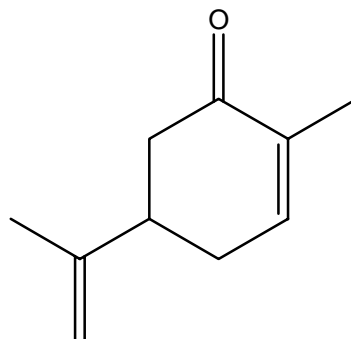
- a) $\text{CH}_3(\text{CH}_2)_{10}\text{COOH}$
- b) $\text{CH}_3(\text{CH}_2)_7\text{CH}_2\text{CH}(\text{CH}_2)_7\text{COOH}$
- c) $\text{CH}_3(\text{CH}_2)_{18}\text{COOH}$
- d) $\text{CH}_3(\text{CH}_2)_4(\text{CH}=\text{CHCH}_2)_4\text{CH}_2\text{CH}_2\text{COOH}$ (cis, trans)

Ans: d) has cis double bonds and therefore the lowest melting points.

100. How many isoprene units are in myrcene and carvone respectively?



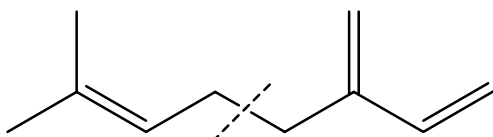
myrcene



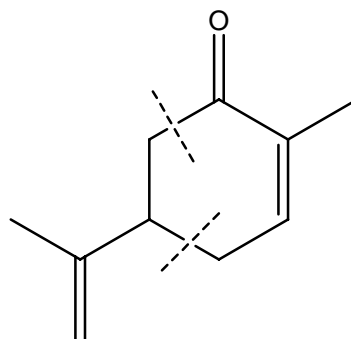
carvone

- a) 2, 3
- b) 4, 4
- c) 3, 3
- d) 2, 2

Ans: d)



myrcene



carvone