Chapter 13

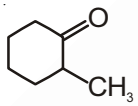
Aldehydes, Ketones and Carboxylic Acids

Solutions (Set-1)

Very Short Answer Type Questions :

1. What product is formed when CH_3COOH reacts with PCl_5?

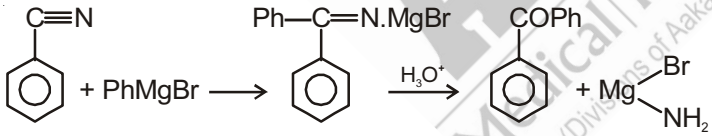
Sol. $CH_3COOH \xrightarrow{PCl_5} CH_3COCl + POCl_3 + HCl$

2. Write IUPAC name of 

Sol. 2-Methylcyclohexanone.

3. Write chemical equation for the following chemical reactions:

Benzonitrile is converted to benzophenone.

Sol. 

4. Draw the structural formula of Hex-2-en-4-ynoic acid.

Sol. $CH_3 - C \equiv C - CH = CH - \overset{\overset{O}{\|}}{C} - OH$.

5. Give one chemical test to distinguish between acetaldehyde and benzaldehyde.

Sol. Acetaldehyde gives positive iodoform reaction while benzaldehyde does not.

6. How are formalin and trioxane related to methanal?

Sol. Formalin is 40% aqueous solution of HCHO and trioxane is a trimer of HCHO.

7. How can we distinguish formic acid and acetic acid chemically?

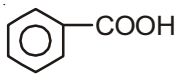
Sol. Formic acid gives silver mirror with Tollen's reagent while acetic acid does not give this test.

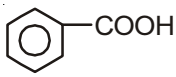
8. How can we obtain Propan-2-ol from ethanal?

Sol. $CH_3CHO + CH_3MgBr \longrightarrow CH_3 - \underset{\displaystyle OMgBr}{\underset{|}{CH}} - CH_3 \xrightarrow{H_2O/H^+} CH_3 - \underset{\displaystyle OH}{\underset{|}{CH}} - CH_3$

9. What product is obtained when CH_3COOH reacts with PCl_5?

Sol. $CH_3COOH + PCl_5 \longrightarrow CH_3COCl + POCl_3 + HCl$.

10. Compare the acidic strength of following acids *i.e.*, (i) HCOOH (ii) CH_3COOH and (iii)  .

Sol. HCOOH >  > CH_3COOH.

Short Answer Type Questions :

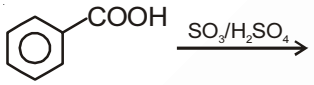
11. Arrange the following compounds in increasing order of their boiling points:

$CH_3CH_2CH_2CHO$, $CH_3(CH_2)_2CH_2OH$, $C_2H_5—O—C_2H_5$, $CH_3(CH_2)_3CH_3$

Sol. All have comparable molecular masses so deciding factor is their intermolecular forces of interaction, which are strongest in alcohol and weakest in alkane. Therefore

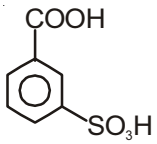
$CH_3(CH_2)_3CH_3 < C_2H_5—O—C_2H_5 < CH_3CH_2CH_2CHO < CH_3(CH_2)_2CH_2OH$

12. Complete the following equations:

(i) 

(ii) $CH_3CONH_2 + HNO_2 \longrightarrow$

(iii) $CH_3CHO + C_6H_5NHNH_2 \longrightarrow$

Sol. (i) 

(ii) $CH_3COOH + N_2 + H_2O$

(iii) $CH_3CH = N—NH—C_6H_5 + H_2O$

acetaldehydephenylhydrazone

13. Describe the following reactions:

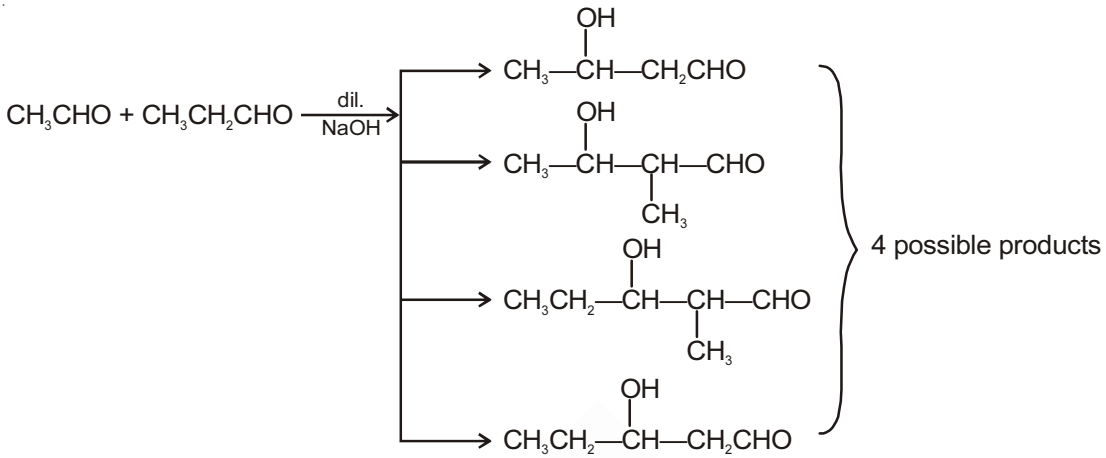
(i) Cannizzaro reaction

(ii) Cross aldol reaction

Sol. (i) **Cannizzaro reaction**: Aldehydes which do not contain any α-H atom undergo disproportionation on treatment with conc. alkali in which one molecule is oxidised and another is reduced.

Ex. $\begin{matrix} H \\ H \end{matrix}\!\!>\!C=O + \begin{matrix} H \\ H \end{matrix}\!\!>\!C=O + \text{conc. KOH} \longrightarrow CH_3OH + HCOOK$

(ii) **Cross Aldol condensation**: When aldol condensation is carried out between two different aldehydes or ketones both containing α-H atom, it is Cross Aldol condensation.

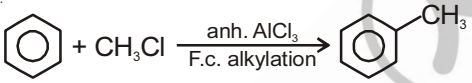


14. Write reactions with conditions for following conversions:

(i) Methylbromide to acetic acid

(ii) Benzene to toluene

Sol. (i) $CH_3Br + KCN(aq) \longrightarrow CH_3CN \xrightarrow{H_2O/H^+} CH_3COOH$

(ii) 

15. Account for the following observations:

(i) Oxidation of toluene to benzaldehyde with CrO_3 is carried out in presence of acetic anhydride.

(ii) Melting point of an acid with even number of carbon atom is higher than those of its neighbours with odd number of carbon atoms.

Sol. (i) Acetic anhydride is used to stop the reaction at benzaldehyde otherwise the end product must be benzoic acid.

(ii) Acids with even no. of carbon atoms fit into crystal lattice more readily than odd ones, hence they have higher lattice energy and higher melting point.

16. How can you convert?

(i) Acetaldehyde to acetone

(ii) Acetylene to acetone

Sol. (i) $CH_3CHO \xrightarrow[(O)]{KMnO_4/H^+} CH_3COOH \xrightarrow{Ca(OH)_2} (CH_3COO)_2Ca \xrightarrow[\text{distillation}]{\text{dry}} CH_3COCH_3 + CaCO_3$

(ii) $HC \equiv CH + NaNH_2 \longrightarrow CH \equiv C - Na \xrightarrow{CH_3Cl} HC \equiv C - CH_3 \xrightarrow{H_2O/HgSO_4,H_2SO_4} CH_3 - \overset{\overset{O}{\|}}{C} - CH_3$

17. Arrange the following in order of increasing boiling points:

(i) $C_2H_5OC_2H_5$, C_4H_9COOH, C_4H_9OH

(ii) C_3H_7CHO, $CH_3COC_2H_5$, $C_2H_5COOCH_3$, $(CH_3CO)_2O$

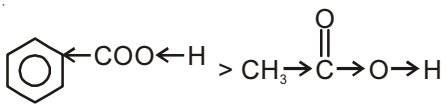
Sol. (i) $C_2H_5OC_2H_5 < C_4H_9OH < C_4H_9COOH$

(ii) $C_3H_7CHO < CH_3COC_2H_5 < C_2H_5COOCH_3 < (CH_3CO)_2O$

18. State reasons for the following:
    (i) Monochloroethanoic acid is a weaker acid than dichloroethanoic acid.
    (ii) Benzoic acid is a stronger acid than ethanoic acid.

Sol. (i) $Cl \leftarrow CH_2 - \underset{\underset{O}{\|}}{C} - OH < Cl \leftarrow \underset{\underset{Cl}{\downarrow}}{CH} - COOH$

Presence of –I effect and EWG increases the H^+ releasing tendency of carboxylic acid.

(ii)  $> CH_3 \rightarrow \underset{\underset{O}{\|}}{C} \rightarrow O \rightarrow H$

Benzene ring withdraws electrons towards itself due to resonance and increases its acidic strength while $-CH_3$ group is electron releasing which decreases its acidic strength.

19. (a) How will you obtain an aldehyde by using following process?
    (i) Dehydrogenation
    (ii) Catalytic hydrogenation
    (b) Why do aldehydes behave like polar compounds?

Sol. (a) (i) $R - CH_2OH \xrightarrow[573K]{Cu} R - CHO + H_2$

(ii) $R - COCl + H_2 \xrightarrow[Xylene]{Pd.\,BaSO_4} R - CHO + HCl$

(b) Due to presence of $>C=O$ *i.e.*, carbonyl group aldehyde molecules are polar.

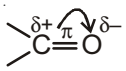
20. How will you do the following conversions in not more than two steps?
    (i) Propanal to butanone
    (ii) Propanoyl chloride to dipropylamine
    (iii) Propanoic acid to propenoic acid

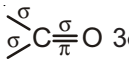
Sol. (i) $CH_3CH_2CHO \xrightarrow[(ii)\,H_3O^+]{(i)\,CH_3MgBr} CH_2 - \underset{\underset{OH}{|}}{CH} - CH_2CH_3 \xrightarrow[conc.\,H^+]{K_2Cr_2O_7} CH_3 - \underset{\underset{O}{\|}}{C} - CH_2 - CH_3$

(ii) $CH_3CH_2COCl \xrightarrow{CH_3CH_2CH_2NH_2} CH_3 - CH_2CONH - CH_2CH_2CH_3 \xrightarrow[conc.\,HCl]{Zn/Hg} \underset{dipropylamine}{C_3H_7NHC_3H_7}$

(iii) $CH_3CH_2COOH \xrightarrow{Red\ P/Cl_2} CH_3 - \underset{\underset{Cl}{|}}{CH} - COOH \xrightarrow{alc.\,KOH} CH_2 = CH - COOH$

21. Draw the structure of a carbonyl group and indicate clearly
    (i) Hybridised state of carbon
    (ii) The σ and π bonds present
    (iii) The electrophilic and nucleophilic centres in it.

Sol. (i)  hybridised state of C is sp^2

(ii)  3σ bonds and 1π bond on C atom.

(iii) 

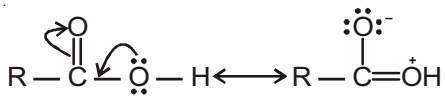
22. Give reasons for the following:

(i) Carboxylic acids do not give characteristic reactions of carbonyl group.

(ii) Treatment of benzaldehyde with HCN gives a mixture of two isomers which can not be separated even by careful fractional distillation.

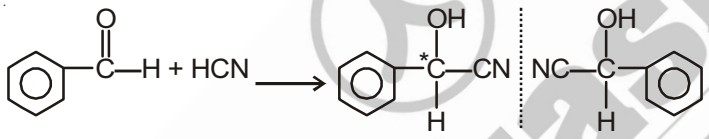
(iii) Sodium bisulphite is used for the purification of aldehydes and ketones.

Sol. (i) Due to resonance position of carbonyl group is changing

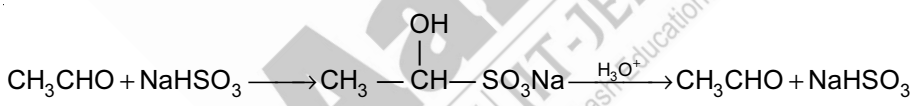


hence these compounds do not give reactions of carbonyl group.

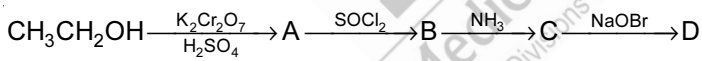
(ii) On nucleophilic addition of HCN to benzaldehyde, it forms two optical isomers which have same physical properties, hence can not be separated by fractional distillation.

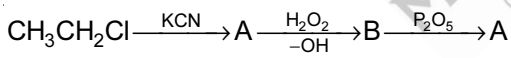


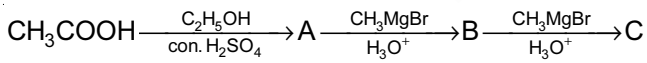
(iii) Aldehydes and ketones form addition products with $NaHSO_3$, whereas impurities don not react and are left behind. Addition products which were earlier crystallised can be easily reconverted to aldehyde and ketone.

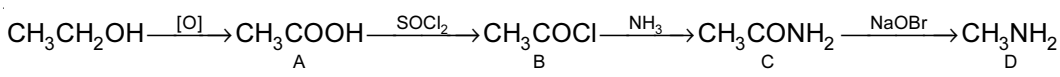


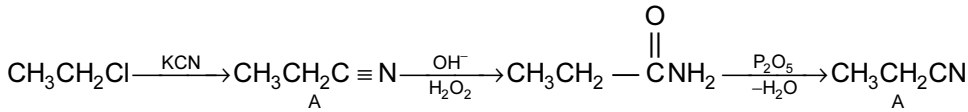
23. Complete the following series of reaction:

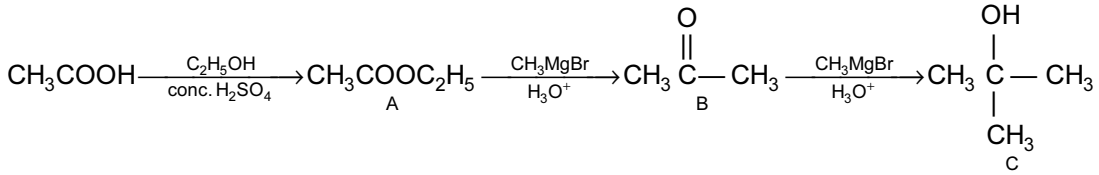
(i) 

(ii) 

(iii) 

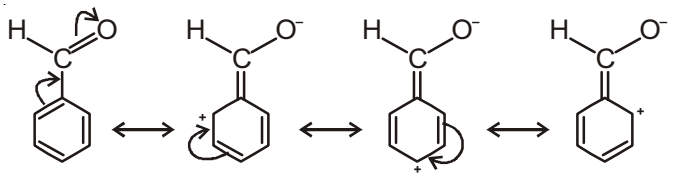
Sol. (i) 

(ii) 

(iii) 

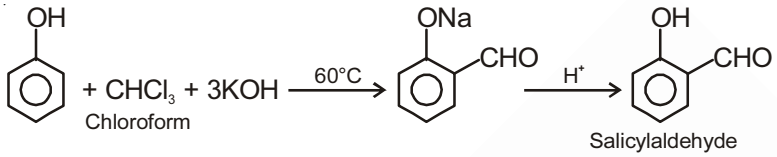
24. Would you expect benzaldehyde to be more or less reactive in nucleophilic addition reactions than propanal? Explain.

Sol. Benzaldehyde is considered to be lesser reactive than propanal due to reduced polarity of carbonyl group.



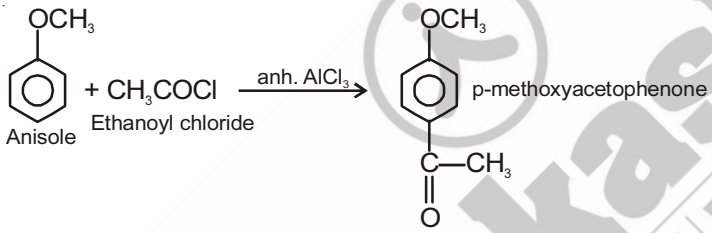
25. Write the names of reagents and equations in the conversions of
    (i) Phenol to salicylaldehyde
    (ii) Anisole to p-methoxyacetophenone

Sol. (i)



It is Reimer Tiemann reaction.

(ii)

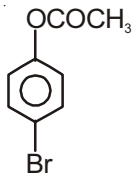


26. Give chemical tests to distinguish between following pairs of compounds:
    (i) Propanoyl chloride and propanoic acid
    (ii) Benzaldehyde and acetophenone

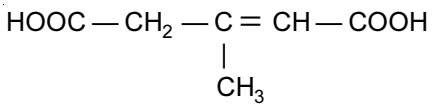
Sol. (i) Propanoyl chloride does not give brisk effervescence with $NaHCO_3$(aq) but propanoic acid does so.
    (ii) Acetophenone gives yellow ppt of iodoform with I_2 and NaOH whereas benzaldehyde does not show this reaction.

27. Write IUPAC names of the following compounds:

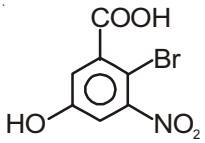
(i)



(ii)



(iii)



Sol. (i) Methyl 4-bromobenzoate

(ii) 3-Methylpent-2-ene-1,5-dioic acid

(iii) 6-Bromo-3-hydroxy-5-nitrobenzoic acid

28. How will you convert?

(i) Ethanal to methane

(ii) Ethanol to propanone

Sol. (i) $CH_3CHO \xrightarrow{[O]} CH_3COOH \xrightarrow{NaOH} CH_3COONa \xrightarrow[+CaO]{NaOH,\ \Delta} CH_4 + Na_2CO_3$

(ii) $CH_3CH_2OH \xrightarrow{[O]} CH_3COOH \xrightarrow{Ca(OH)_2} (CH_3COO)_2Ca \xrightarrow[\text{distillation}]{\text{dry}} CH_3{-}CO{-}CH_3 + CaCO_3$

29. Write chemical equations, for the following reactions:

(i) Action of conc. NaOH on 2,2-Dimethyl propanal

(ii) Action of dil. NaOH on propanal.

Sol. (i) $CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-CHO \xrightarrow[\text{Cannizzaro reaction}]{\text{conc. NaOH}} CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-COONa + CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-CH_2OH$

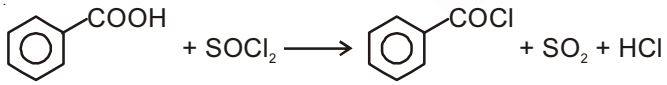
(ii) $2CH_3-CH_2CHO \xrightarrow[\text{Aldol cond.}]{\text{dil. NaOH}} CH_3-CH_2-\underset{\displaystyle CH_3}{\overset{\displaystyle OH}{\overset{|}{\underset{|}{CH}}}}-CH-CHO$

30. Write balanced chemical equations for the following reactions:

(i) Thionyl chloride reacts with benzoic acid

(ii) Acetic acid is treated with Red P and HI

(iii) Acetic acid is treated with Zn metal.

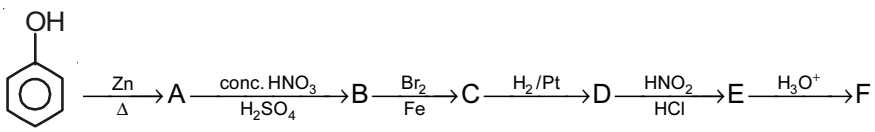
Sol. (i) 

(ii) $CH_3COOH + 6HI \xrightarrow{\text{Red P}} CH_3-CH_3 + 3I_2 + 2H_2O$

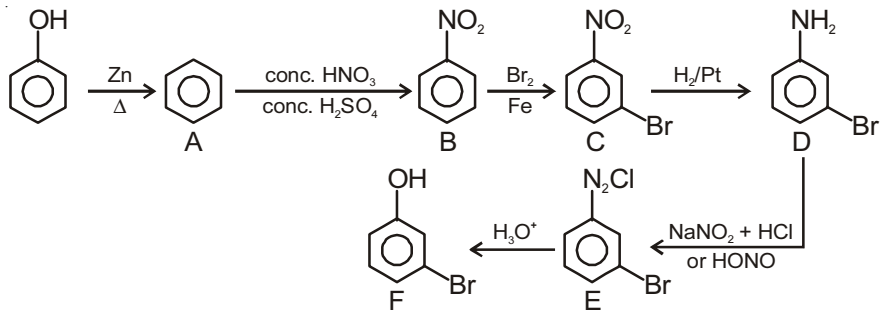
(iii) $2CH_3COOH + Zn \longrightarrow (CH_3COO)_2Zn + H_2$

Long Answer Type Questions :

31. Write structures of organic compounds A to F in the following sequence of reactions



Sol.



32. (a) How can the following compounds be obtained?
    (i) Acetic acid from acetylene
    (ii) Acetone from acetic acid
    (iii) Acetaldehyde from acetic acid
    (b) In what way can acetic acid be distinguished from acetone?

Sol. (a) (i) $HC \equiv CH + H_2O \xrightarrow[HgSO_4]{H_2SO_4} CH_3CHO \xrightarrow{[O]} CH_3COOH$

(ii) $CH_3COOH \xrightarrow{Ca(OH)_2} (CH_3COO)_2Ca \xrightarrow{\text{dry distillation}} CH_3COCH_3 + CaCO_3$

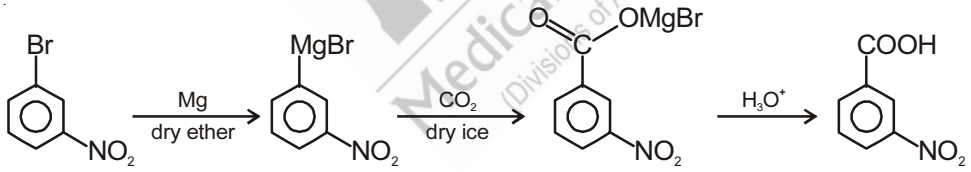
(iii) $CH_3COOH \xrightarrow{LiAlH_4} CH_3CH_2OH \xrightarrow[573K]{Cu} CH_3CHO + H_2$

(b) Acetone shows iodoform reaction and gives yellow ppt of CHI_3 with NaOH and I_2, acetic acid does not give this reaction.

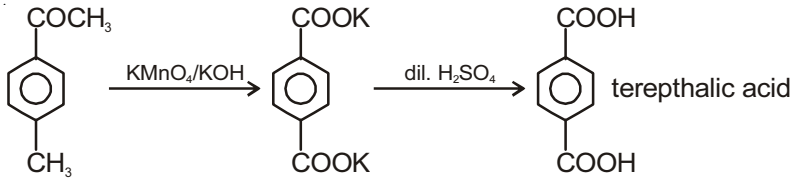
33. Write chemical reactions to show the following conversions:
    (i) Butanol to butanoic acid
    (ii) 3-Nitrobromobenzene to 3-Nitrobenzoic acid
    (iii) 4-Methylacetophenone to Benzene-1,4-dicarboxylic acid
    (iv) Cyclohexene to Hexane-1,6-dioic acid

Sol. (i) $CH_3CH_2CH_2CH_2OH \xrightarrow[\text{Jones Reagent}]{CrO_3 - H_2SO_4} CH_3CH_2CH_2COOH$

(ii)



(iii)



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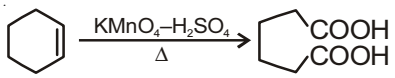
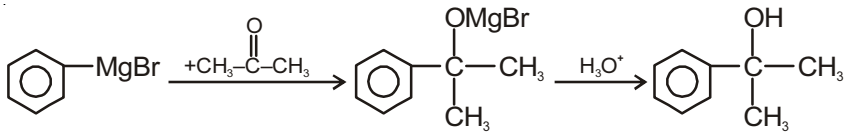


34. How will you synthesise the following by using a Grignard reagent?
    (i) 2,2-Dimethylpentanoic acid
    (ii) But-3-enoic acid
    (iii) 2-Phenylpropan-2-ol

Sol. (i) $CH_3CH_2CH_2-\underset{\underset{CH_3}{|}}{\overset{CH_3}{\overset{|}{C}}}-Br \xrightarrow{Mg/ether} \left[CH_3CH_2CH_2-\underset{\underset{CH_3}{|}}{\overset{CH_3}{\overset{|}{C}}}-MgBr\right] \xrightarrow[(ii)H^+]{(i)CO_2} CH_3CH_2CH_2-\underset{\underset{CH_3}{|}}{\overset{CH_3}{\overset{|}{C}}}-COOH$

(ii) $CH_2=CH-CH_2Br \xrightarrow[ether]{Mg} CH_2=CH-CH_2MgBr \xrightarrow[(ii)H^+]{(i)CO_2} CH_2=CH-CH_2COOH$

(iii) 

35. (a) Why has monochloroethanoic acid higher pK_a value than dichloroethanoic acid?

(b) Give formulas of compounds A and B

$CH_3MgBr + CO_2 \xrightarrow[H_3O^+]{\text{dry ether}} A \xrightarrow{PCl_5} B$

(c) Identify compounds A and B

$CH_3COOH \xrightarrow{SOCl_2} A \xrightarrow{LiAlH_4} B$

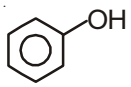
Sol. (a) Out of $Cl-CH_2COOH$ and $Cl-\underset{\underset{Cl}{|}}{CH}-COOH$, the later one has two —Cl atoms and more electron withdrawing influence hence it is more acidic having lesser pK_a value.

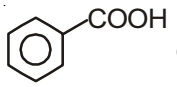
(b) $CH_3MgBr + CO_2 \longrightarrow \underset{}{CH_3COOMgBr} \xrightarrow{H_3O^+} \underset{A}{CH_3COOH} \xrightarrow{PCl_5} \underset{B}{CH_3COCl}$

(c) $CH_3COOH \xrightarrow{SOCl_2} \underset{A}{CH_3COCl} \xrightarrow{LiAlH_4} \underset{B}{CH_3CH_2OH}$

36. Which out of each pair is expected to be a stronger acid?

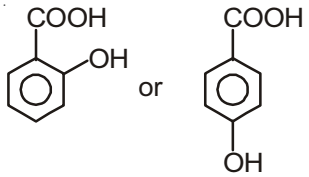
(a) CH_3COOH or HCOOH

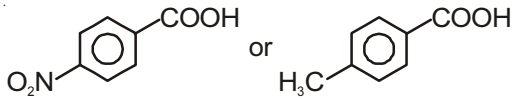
(b) CH_3COOH or 

(c) 

or HCOOH

(d) $\underset{\underset{Cl}{|}}{CH_2-COOH}$ or $\underset{\underset{Br}{|}}{CH_2-COOH}$

(e) 

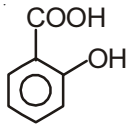
(f) 

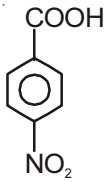
Sol. (a) HCOOH

(b) CH_3COOH

(c) HCOOH

(d) $Cl—CH_2—COOH$

(e) 

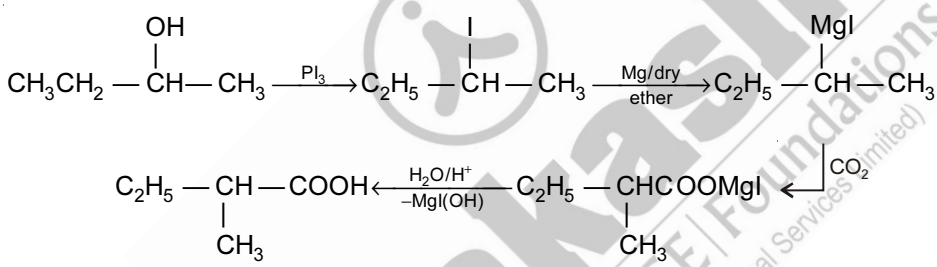
(f) 

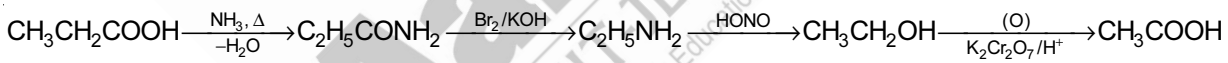
37. How will you convert

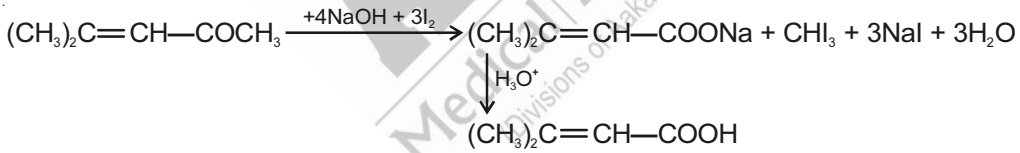
(a) Butan-2-ol to 2-methylbutanoic acid

(b) Propanoic acid to acetic acid

(c) $(CH_3)_2C = CH—COCH_3$ to $(CH_3)_2C = CH—COOH$

Sol. (a) 

(b) 

(c) 

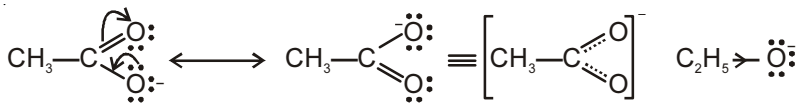
38. Give reasoning for the following:

(a) CH_3COO^- ion is more stable than $C_2H_5O^-$ ion

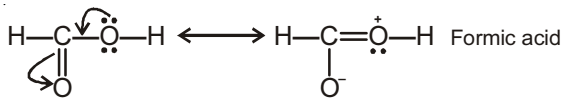
(b) Tertiary butylbenzene does not give benzoic acid when oxidised with $KMnO_4$

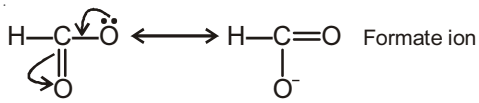
(c) Carbon oxygen bond lengths in formic acid are different but are the same in sodium formate.

Sol. (a) In acetate ion there is delocalisation of –ve charge which is not possible in ethoxide ion.



(b) To oxidise the alkyl group attached to benzene ring atleast one α-hydrogen must be present *e.g.*, toluene gets oxidised to benzoic acid but tert butyl group has no α-H hydrogen hence it does not oxidise with $KMnO_4$.

(c)  Formic acid

 Formate ion

In **formate** ion contributing structures for anion are equivalent while these are not the same in formic acid.

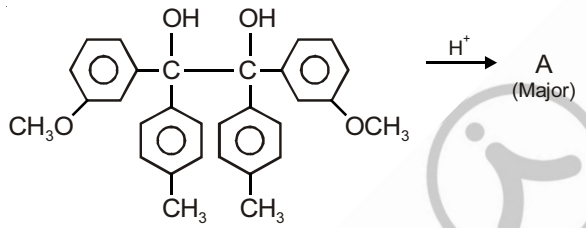
❑ ❑ ❑

Chapter 13

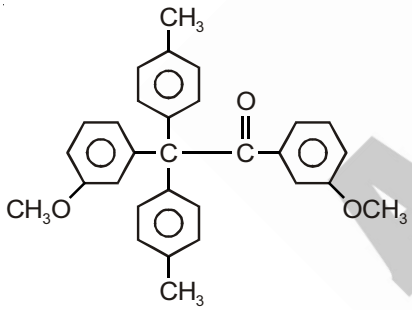
Aldehydes, Ketones and Carboxylic Acids

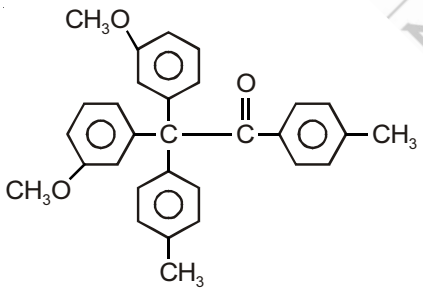
Solutions (Set-2)

[Aldehydes and Ketones (Preparation and Reactions)]

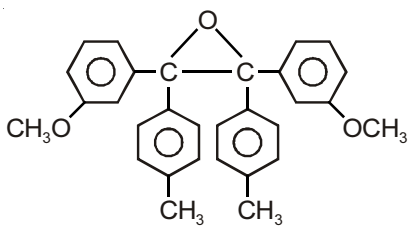
1. 

Major product A is

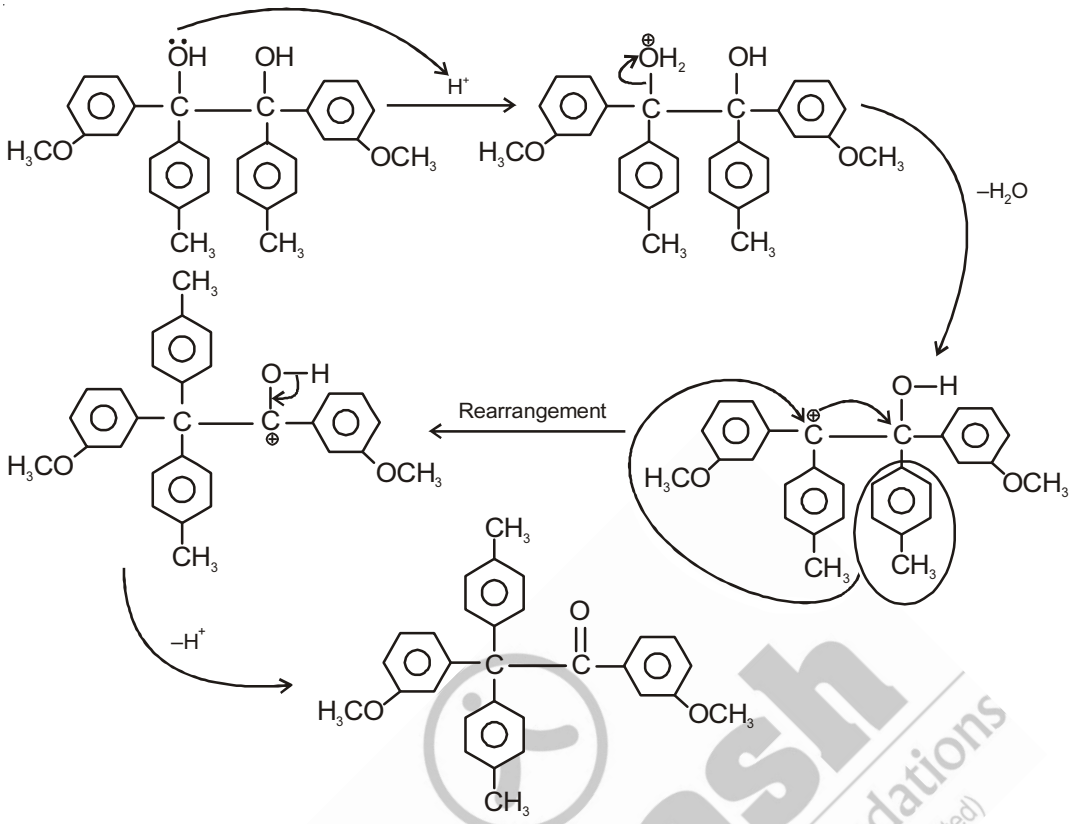
(1) 

(2) 

(3) Both (1) & (2)

(4) 

Sol. Answer (1)



Migrating power of p-tolyl is more than m-anisyl.

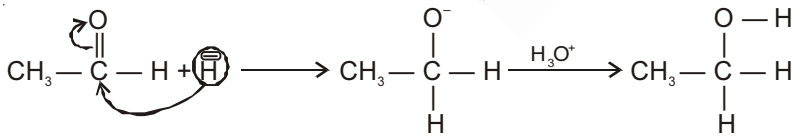
2. $CH_3CHO + LiAlH_4 \longrightarrow CH_3CH_2OH$

Nucleophile added in this reaction is

(1) AlH_4^- (2) Li^+ (3) H^+ (4) H^-

Sol. Answer (4)

$LiAlH_4 \rightarrow Li^+ + Al^{3+} + 4H^-$



3. Complete the reaction : $Ph-CH=CH-CHO \xrightarrow[H_3O^+]{PhMgBr\ (Cu^{2+})} Product$

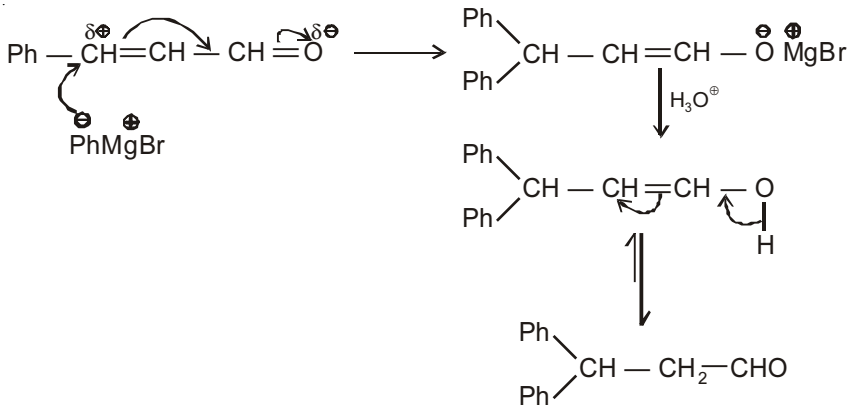
(1) $Ph-\underset{Ph}{CH}-\underset{OH}{CH}-CHO$

(2) $Ph-\underset{Ph}{CH}-CH_2-CHO$

(3) $Ph-\underset{OH}{CH}-\underset{Ph}{CH}-CHO$

(4) $Ph-\underset{Ph}{CH}-CH_2-CH_2-OH$

Sol. Answer (2)



4. $\begin{matrix} H \\ D \end{matrix}\!\!>\!C = O \xrightarrow{Nu^{\ominus}}$ Product. Product may be

(1) Meso (2) Racemic (3) Inversion (4) All of these

Sol. Answer (2)

Product may be recemic, because carbonyl carbon is sp^2 hybridised and has planar shape. So, Nu^- attacks on front as well as back side.

5. $CH_3 - \overset{O}{\overset{\|}{C}} - CH_2 - CH_3 \xrightarrow[HNO_3]{Conc.}$ Product

The product is

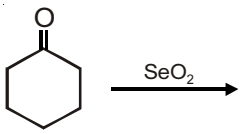
(1) CH_3COOH (2) $CH_3CH_2COOH + HCOOH$

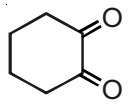
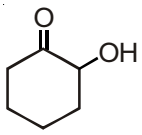
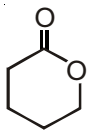
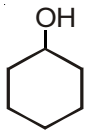
(3) $CH_3CH_2CH_2COOH$ (4) No reaction

Sol. Answer (1)

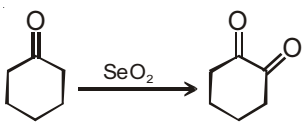
$$CH_3-\overset{O}{\overset{\|}{C}}-CH_2-CH_3 \xrightarrow{Conc.HNO_3} 2CH_3COOH$$

According to Popoff's rule, carbonyl group goes with less complex alkyl group.

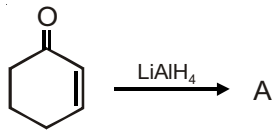
6. 

(1)  (2)  (3)  (4) 

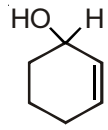
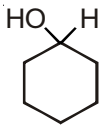
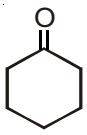
Sol. Answer (1)



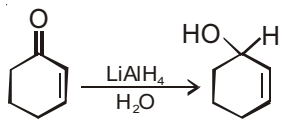
In this reaction, active methylene group ($—CH_2—$) is oxidised to $>C=O$ group.

7. 

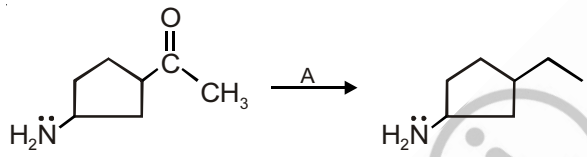
The product predominates is

(1)  (2)  (3)  (4) 

Sol. Answer (1)



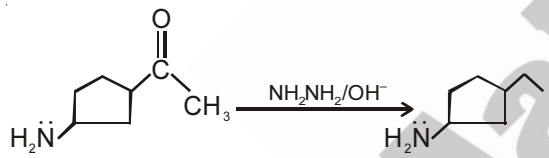
$LiAlH_4$ does not reduce double bond. If double bond is conjugated with phenyl system then double bond is reduced by $LiAlH_4$.

8. 

A is

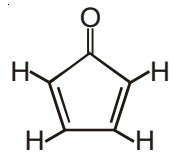
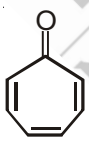
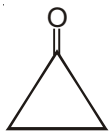
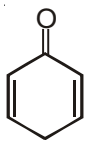
(1) Zn – Hg/HCl (2) $NH_2 - NH_2/OH^-$ (3) Both (1) & (2) (4) $NaBH_4$

Sol. Answer (2)

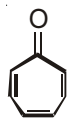


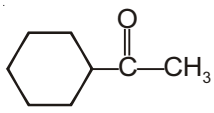
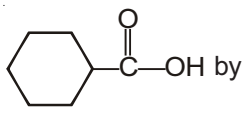
In this reaction, Zn — Hg/HCl is not used because in acidic medium, $—NH_2$ group is affected.

9. Which of the following carbonyl oxygen will form strongest hydrogen bond with H_2O molecule?

(1)  (2)  (3)  (4) 

Sol. Answer (2)

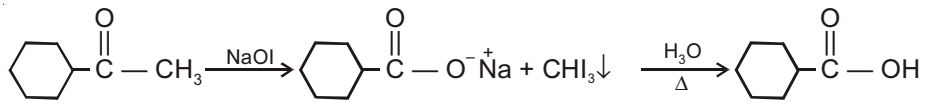
 forms strongest hydrogen bond with H_2O molecule because in this case carbonyl carbon readily attains +ve charge due to aromaticity

10. The compound  can be exclusively oxidized into  by

(1) NaCN followed by hydrolysis (2) NaOI followed by H_3O^+

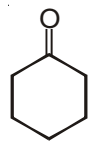
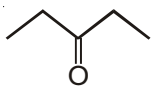
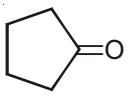
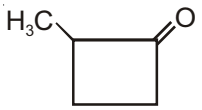
(3) $KMnO_4$ hot followed by hydrolysis (4) $K_2Cr_2O_7$ followed H_3O^+

Sol. Answer (2)

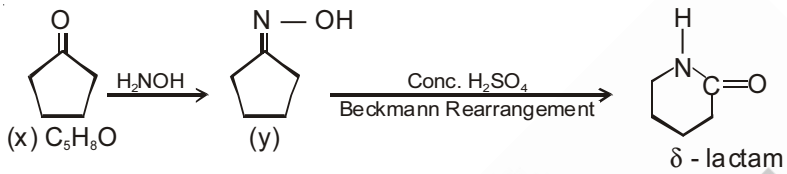


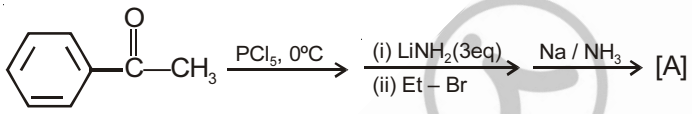
The above conversion is known as iodoform reaction.

11. An organic compound [x], C_5H_8O reacts with hydroxylamine to form [y], [y] in the presence of conc. H_2SO_4 gives δ-lactam. [x] neither give Benedicts test nor it respond positively towards haloform test. The compound [x] is

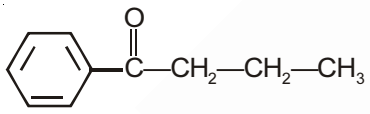
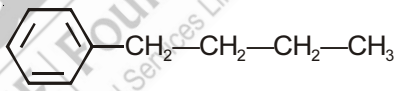
(1)  (2)  (3)  (4) 

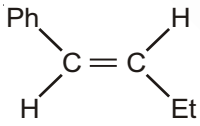
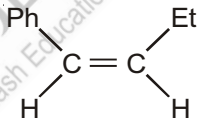
Sol. Answer (3)



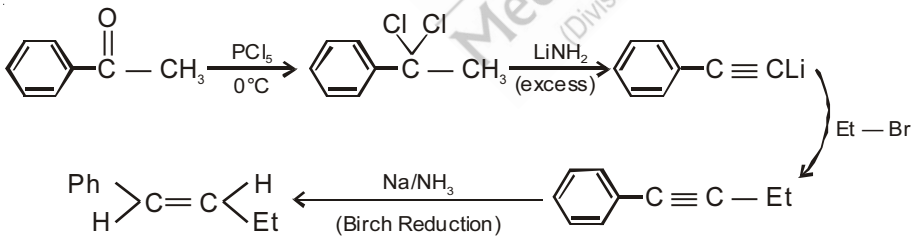
12. 

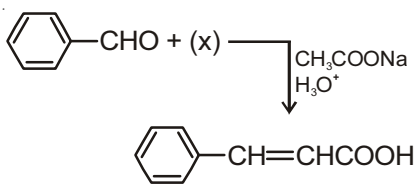
A is

(1)  (2) 

(3)  (4) 

Sol. Answer (3)



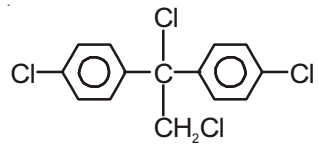
13. 

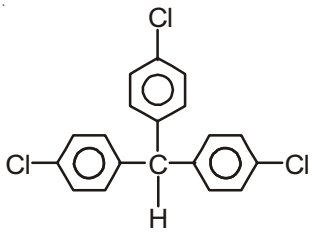
The compound x is

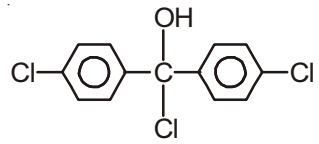
(1) CH_3COOH (2) $BrCH_2$—COOH (3) $(CH_3CO)_2O$ (4) CHO—COOH

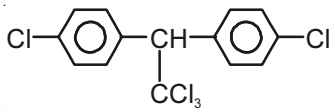
Sol. Answer (3)

14. Trichloroacetaldehyde, CCl_3CHO reacts with chlorobenzene in presence of sulphuric acid and produces

(1) 

(2) 

(3) 

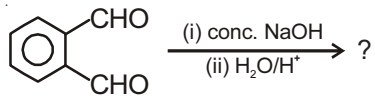
(4) 

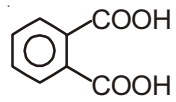
Sol. Answer (4)

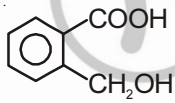
15. Which of the following compound will exhibits positive Fehling test as well as iodoform test?

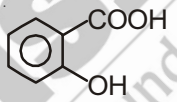
(1) Methanal (2) Ethanol (3) Propanone (4) Ethanal

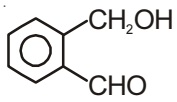
Sol. Answer (4)

16. 

(1) 

(2) 

(3) 

(4) 

Sol. Answer (2)

17. An aromatic compound 'X' with molecular formula $C_9H_{10}O$ gives the following chemical tests

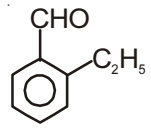
(i) Forms 2,4-DNP derivative

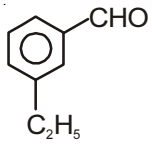
(ii) Reduce Tollens reagent

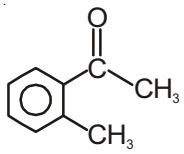
(iii) Undergoes Cannizzaro reaction and

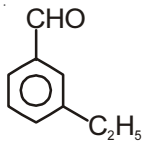
(iv) On vigorous oxidation, 1,2-benzenedicarboxylic acid is obtained

The compound is

(1) 

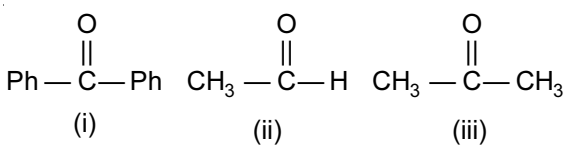
(2) 

(3) 

(4) 

Sol. Answer (1)

18. The correct order of reactivity of PhMgBr towards given compounds



(1) (i) > (ii) > (iii) (2) (iii) > (ii) > (i) (3) (ii) > (iii) > (i) (4) (i) > (iii) > (ii)

Sol. Answer (3)

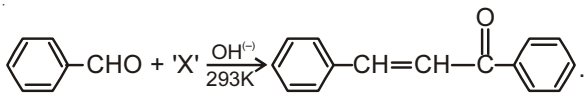
19. The increasing order of the rate of HCN addition to compounds A–D is

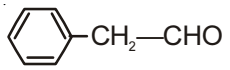
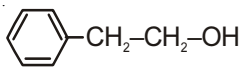
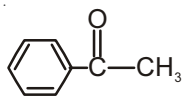
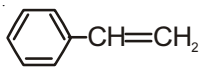
(A) HCHO (B) CH_3COCH_3

(C) $PhCOCH_3$ (D) PhCOPh

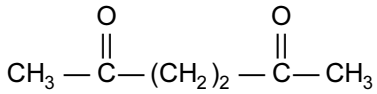
(1) A < B < C < D (2) D < B < C < A (3) D < C < B < A (4) C < D < B < A

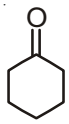
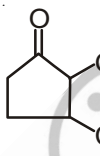
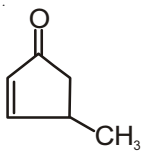
Sol. Answer (3)

20.  . Identify 'X'

(1)  (2)  (3)  (4) 

Sol. Answer (3)

21. The diketone  on intramolecular aldol condensation gives the final product

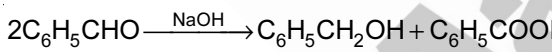
(1)  (2)  (3)  (4) 

Sol. Answer (3)

22. Enol content is high test in

(1) Acetone (2) Acetophenone (3) Acetic acid (4) Acetyl acetone

Sol. Answer (4)

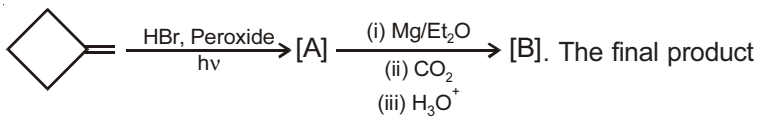
23. 

The similar reaction can take place with which of the following aldehyde?

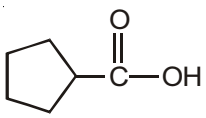
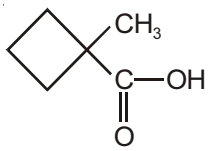
(1) CH_3CHO (2) CH_3CH_2CHO (3) $(CH_3)_3CCHO$ (4) $CH_3CH_2CH_2CHO$

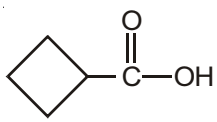
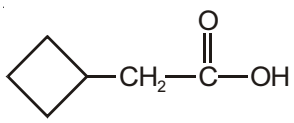
Sol. Answer (3)

[Carboxylic Acids (Preparation and Reactions)]

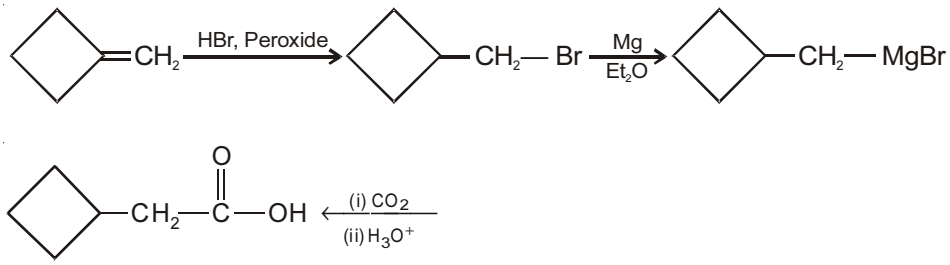
24. Consider the following sequence of reaction :  . The final product

[B] in the reaction would be :

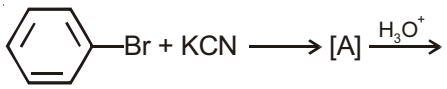
(1)  (2) 

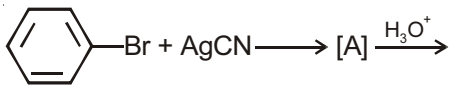
(3)  (4) 

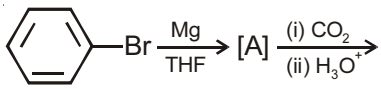
Sol. Answer (4)

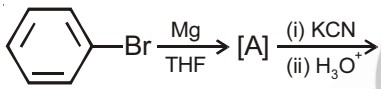


25. Which of the following would be the best synthesis of benzoic acid from bromobenzene?

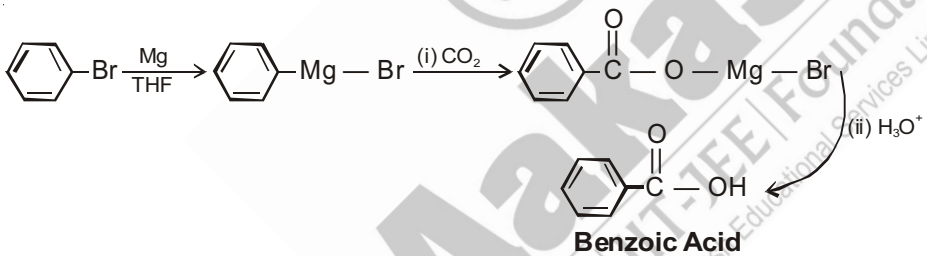
(1) 

(2) 

(3) 

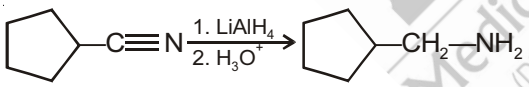
(4) 

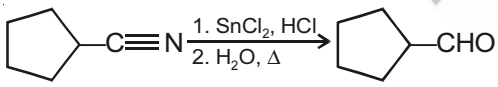
Sol. Answer (3)

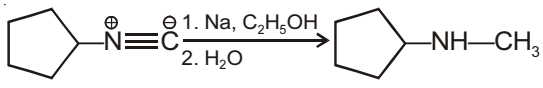


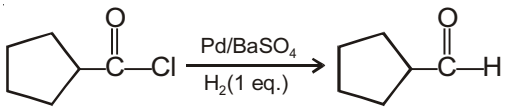
Benzoic Acid

26. Which of the following conversion is known as Stefen's reduction?

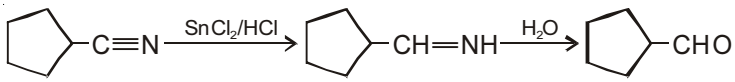
(1) 

(2) 

(3) 

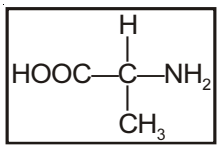
(4) 

Sol. Answer (2)



This is known as Stephen's reduction.

27. Alanine can be obtained from acetaldehyde by the following sequence of reactions



Alanine

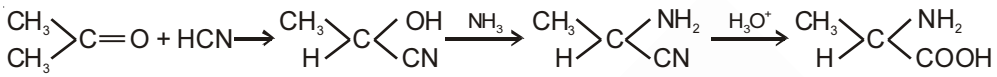
(1) Reaction with NaCN and NH_4Cl followed by acidic hydrolysis

(2) Reaction with HCN, acidic hydrolysis and finally reaction with NH_3

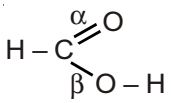
(3) Reaction with HCN, followed by NH_3 and finally acidic hydrolysis

(4) Reaction with $NaHSO_3$, followed by NH_3 and finally acidic hydrolysis

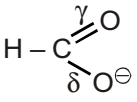
Sol. Answer (1)



Acetaldehyde **Alanine**

28. 

(I)

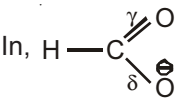
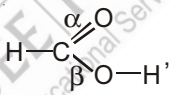


(II)

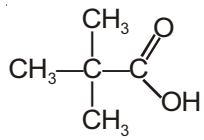
(C – O) bond length designated by α, β, γ and δ are in order

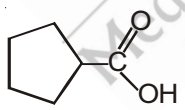
(1) $\alpha = \gamma < \beta = \delta$ (2) $\alpha < \beta < \gamma = \delta$ (3) $\alpha < \gamma = \delta < \beta$ (4) $\alpha = \beta = \gamma = \delta$

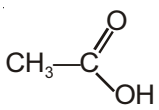
Sol. Answer (3)

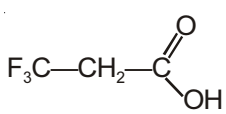
In,  due to complete resonance, $\gamma = \delta$, While in  , partial resonance is present. So, $\alpha < \beta$.

29. Which of the following carboxylic acid is most reluctant to form ester with a given alcohol in the presence of a catalytic amount of concentrated H_2SO_4?

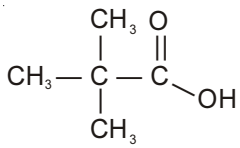
(1) 

(2) 

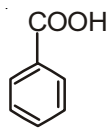
(3) 

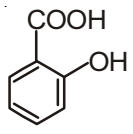
(4) 

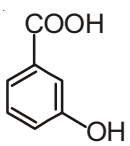
Sol. Answer (1)

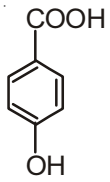
 is most reluctant to form ester with alcohol due to presence of bulky group.

30. Which of the following aromatic acids is most acidic?

(1) 

(2) 

(3) 

(4) 

Sol. Answer (2)

31. Which one of the following orders of acid strength is correct?

(1) RCOOH > HC ≡ CH > HOH > ROH (2) RCOOH > ROH > HOH > HC ≡ CH

(3) RCOOH > HOH > ROH > HC ≡ CH (4) RCOOH > HOH > HC ≡ CH > ROH

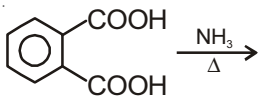
Sol. Answer (3)

32. The correct order of acidic strength of the carboxylic acid is

(1) Formic acid < Benzoic acid < Acetic acid (2) Formic acid < Acetic acid < Benzoic acid

(3) Acetic acid < Formic acid < Benzoic acid (4) Acetic acid < Benzoic acid < Formic acid

Sol. Answer (4)

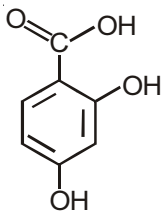
33.  A. Identify 'A'

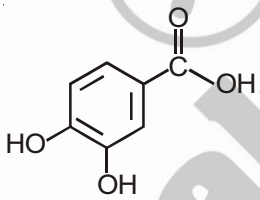
(1) Benzene (2) Phthalimide (3) Benzamide (4) Acetaldehyde

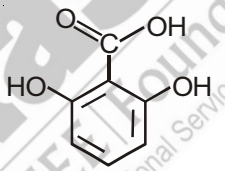
Sol. Answer (2)

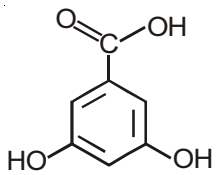
[Acid Derivatives (Preparation and reactions)]

34. Among the given compounds


(I)


(II)


(III)

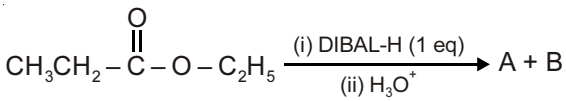

(IV)

The order of decreasing acidity is

(1) III > IV > I > II (2) I > IV > II > III (3) III > I > IV > II (4) III > I > II > IV

Sol. Answer (3)

Due to ortho effect, (III) and (I) are most acidic. If —OH group is present at p-position w.r.t. —COOH group, then it becomes less acidic.

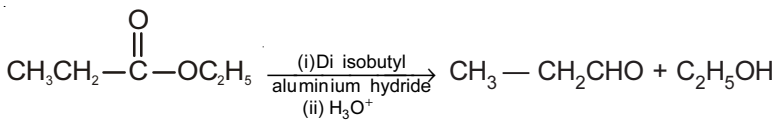
35. 

A and B are respectively

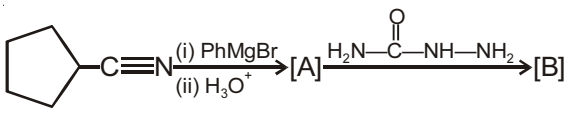
(1) $CH_3CH_2CH_2OH + C_2H_5OH$ (2) $CH_3CH_2CHO + C_2H_5OH$

(3) $CH_3CH_2CHO + CH_3CHO$ (4) $CH_3CH_2CH_2OH + CH_3CHO$

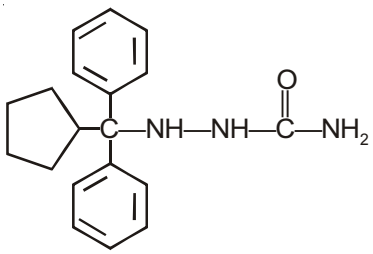
Sol. Answer (2)

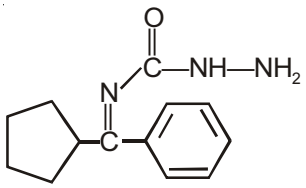


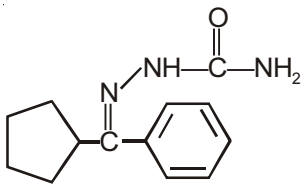
36. Consider the following sequence of reactions.

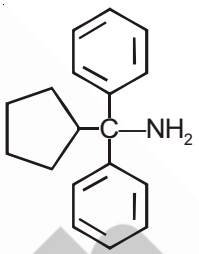


Major product [B] of the given reaction would be

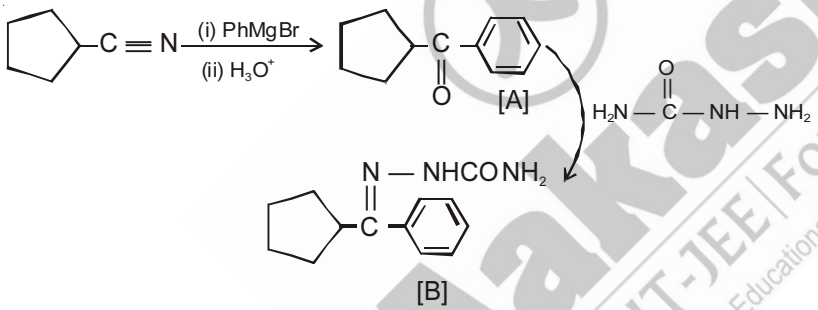
(1) 

(2) 

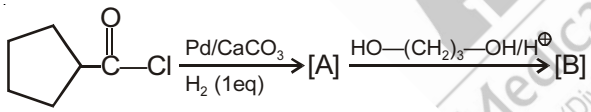
(3) 

(4) 

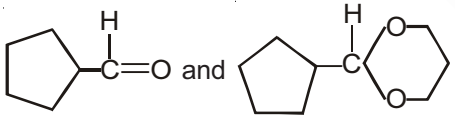
Sol. Answer (3)

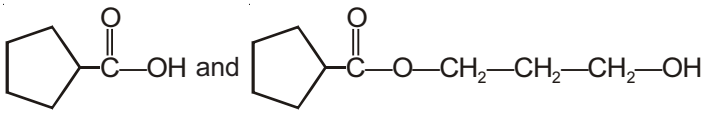


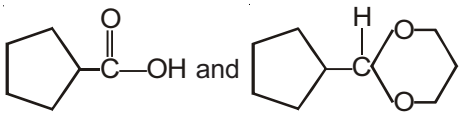
37. Consider the following sequence of reactions.

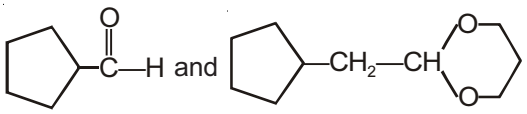


The products [A] and [B] are respectively

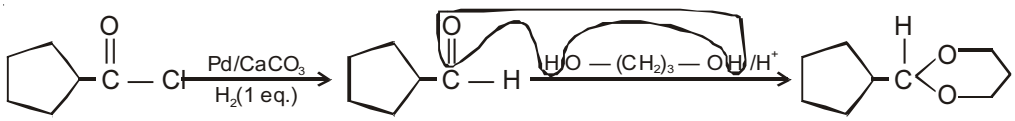
(1) 

(2) 

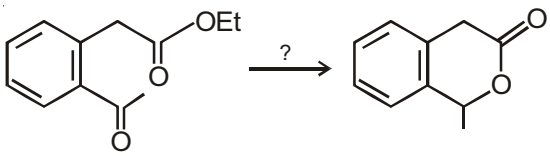
(3) 

(4) 

Sol. Answer (1)

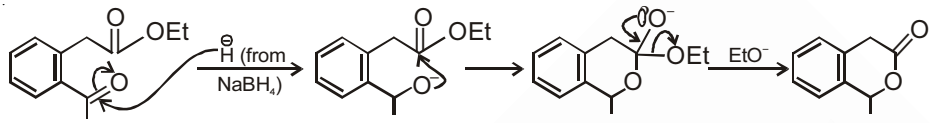


38. Which reagent or sequence of reagents would best accomplish the following synthesis?



(1) (i) $LiAlH_4$ (ii) H^+, Δ
(2) (i) $NaBH_4$ (ii) dil. H_2SO_4 (iii) conc.H_2SO_4
(3) (i) Na / NH_3 (ii) $NaBH_4$ / H^+, Δ
(4) (i) Mg / Et_2O (ii) $LiAlH_4$, (iii) H^+, Δ

Sol. Answer (2)



39. In esterification

(1) OH^- of acid is replaced by C_6H_5OH
(2) H^+ of acid is replaced by sodium metal
(3) OH^- of alcohol is replaced by chlorine
(4) OH^- of acid is replaced by RO^- group

Sol. Answer (4)

40. The compound which is not reduced by $LiAlH_4$ is

(1) Cyclohexanone (2) 2-Methyl-1-butanol (3) Ethyl benzoate (4) ω-caprolactam

Sol. Answer (2)

Alcohols can't be reduced by $LiAlH_4$. Only carbonyl compound, carboxylic acid and acid derivatives are reduced by $LiAlH_4$

❑ ❑ ❑