26

Aldehydes, Ketones and Carboxylic Acids

TOPIC 1 Methods of Preparation of Carbonyl Compounds

1. The major products of the following reaction are:

[Sep. 06, 2020 (I)]

$$CH_3-\underset{\displaystyle OSO_2CH_3}{\underset{|}{CH}}-\underset{|}{CH}-CH_3 \xrightarrow[(ii)O_3\,/\,H_2O_2]{(i)KO^tBu/\Delta}$$

(a) $CH_3-\underset{CH_3}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}}=O$ + CH_3CHO

(b) $CH_3-\underset{CH_3}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}}=O$ + CH_3COOH

(c) $CH_3-\underset{CH_3}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}}-CHO$ + HCHO

(d) $CH_3-\underset{CH_3}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}}-COOH$ + HCOOH

2. The correct match between Item - I (starting material) and Item - II (reagent) for the preparation of benzaldehyde is :

[Sep. 06, 2020 (II)]

Item - I	Item - II
(I) Benzene	(P) HCl and $SnCl_2$, H_3O^+
(II) Benzonitrile	(Q) H_2, Pd-$BaSO_4$, S and quinoline
(III) Benzoyl Chloride	(R) CO, HCl and $AlCl_3$

(a) (I) - (Q), (II) - (R) and (III) - (P)

(b) (I) - (P), (II) - (Q) and (III) - (R)

(c) (I) - (R), (II) - (P) and (III) - (Q)

(d) (I) - (R), (II) - (Q) and (III) - (P)

3. In the following reaction A is:

[Jan. 09, 2020 (II)]

$$A \xrightarrow[\text{(ii) KOH (alc.)}\\\text{(iii) } O_3\\\text{(iv) } (CH_3)_2S\\\text{(v) NaOH(aq) + }\Delta]{\text{(i) } Br_2,\ h\nu} \text{H-C(=O)-cyclopentene}$$

(a) 

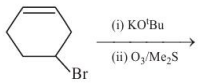
(b) 

(c) 

(d) 

4. The major product(s) obtained in the following reaction is/are :

[April 12, 2019 (I)]



(a) OHC–CHO and OHC-CHO

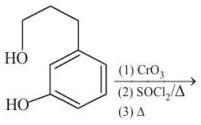
(b) OHC–CH=CH–CHO

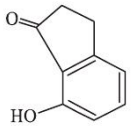
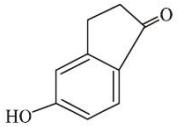
(c) OHC–CH(CHO)–CHO

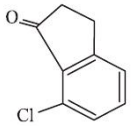
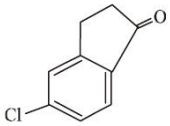
(d) OHC–CH(O^{t}Bu)–CHO

5. The major product of the following reaction is:

[April 12, 2019 (I)]

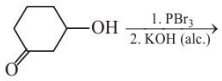


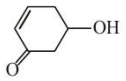
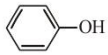
(a)  (b) 

(c)  (d) 

6. The major product of the following reaction is:

[April 9, 2019 (I)]



(a)  (b) 

(c)  (d) 

7. In the following reaction **[April 9, 2019 (II)]**

Carbonyl compound + MeOH $\overset{HCl}{\rightleftharpoons}$ acetal

Rate of the reaction is the highest for:

(a) Acetone as substrate and methanol in excess.
(b) Propanal as substrate and methanol in stoichiometric amount.
(c) Propanal as substrate and methanol in excess.
(d) Acetone as substrate and methanol in stoichiometric amount.

8. In the following reaction **[Jan. 12, 2019 (I)]**

$$\text{Aldehyde+Alcohol} \xrightarrow{HC\ell} \text{Acetal}$$

Aldehyde	Alcohol
HCHO	^{t}BuOH
CH_3CHO	MeOH

The best combination is:

(a) CH_3CHO and ^{t}BuOH (b) HCHO and MeOH

(c) CH_3CHO and MeOH (d) HCHO and ^{t}BuOH

9. The major product of the following reaction is:

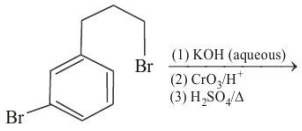
$$R-C\equiv N \xrightarrow[(ii)\ H_2O]{(i)\ AlH(i\text{-}Bu)_2}$$

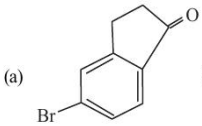
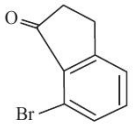
[Jan. 9, 2019 (I)]

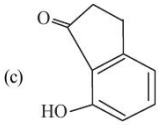
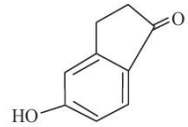
(a) RCOOH (b) $RCONH_2$ (c) RCHO (d) RCH_2NH_2

10. The major product of the following reaction is:

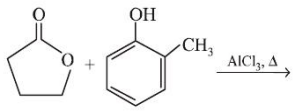
[Jan. 9, 2019 (I)]



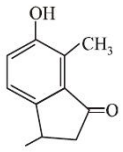
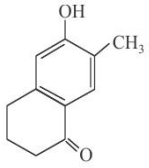
(a)  (b) 

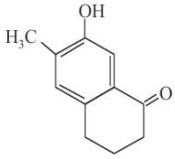
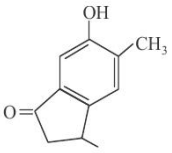
(c)  (d) 

11. The major product of the following reaction is:

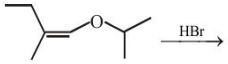


[Jan. 9, 2019 (II)]

(a)  (b) 

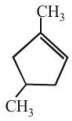
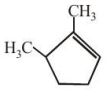
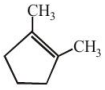
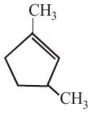
(c)  (d) 

12. The total number of optically active compounds formed in the following reaction is: **[Online April 15, 2018 (II)]**



(a) Zero (b) Six (c) Four (d) Two

13. Which compound would give 5 - keto - 2 - methylhexanal upon ozonolysis ? **[2015]**

(a) 
(b) 
(c) 
(d) 

14. Which of the following on heating with aqueous KOH, produces acetaldehyde? **[2009]**

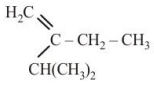
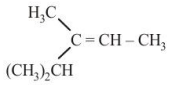
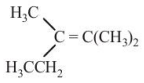
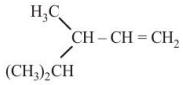
(a) CH_3CH_2Cl (b) CH_2ClCH_2Cl
(c) CH_3CHCl_2 (d) CH_3COCl

TOPIC 2 Properties of Carbonyl Compounds

15. The major product [R] in the following sequence of reactions is : **[Sep. 04, 2020 (II)]**

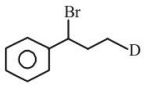
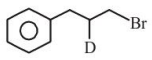
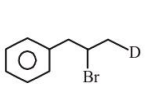
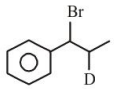
$$HC \equiv CH \xrightarrow[(ii)\ H_3C-CH(CH_3)_2-CH-Br]{(i)\ LiNH_2/ether} [P]$$

$$\xrightarrow[(ii)\ NaBH_4]{(i)\ HgSO_4/H_2SO_4} [Q] \xrightarrow[\Delta]{Conc.\ H_2SO_4} [R]$$

(a) 
(b) 
(c) 
(d) 

16. The major product [C] of the following reaction sequence will be : **[Sep. 04, 2020 (II)]**

$$CH_2 = CH - CHO \xrightarrow[(ii)\ SOCl_2]{(i)\ NaBH_4} [A] \xrightarrow[Anhy.\ AlCl_3]{} [B] \xrightarrow{DBr} [C]$$

(a) 
(b) 
(c) 
(d) 

17. The increasing order of the reactivity of the following compounds in nucleophilic addition reaction is :
Propanal, Benzaldehyde, Propanone, Butanone
[Sep. 03, 2020 (II)]

(a) Benzaldehyde < Butanone < Propanone < Propanal
(b) Butanone < Propanone < Benzaldehyde < Propanal
(c) Propanal < Propanone < Butanone < Benzaldehyde
(d) Benzaldehyde < Propanal < Propanone < Butanone

18. The compound A in the following reactions is :
[Sep. 03, 2020 (II)]

$$A \xrightarrow[(ii)\ Conc.\ H_2SO_4/\Delta]{(i)\ CH_3MgBr/H_2O}$$

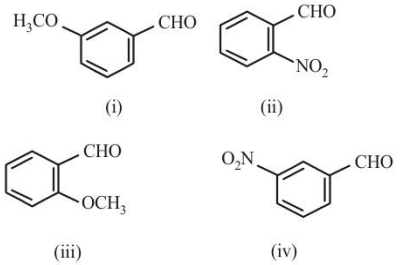
$$B \xrightarrow[(ii)\ Zn/H_2O]{(i)\ O_3} C + D$$

$$C \xrightarrow[(ii)\ \Delta]{(i)\ Conc.\ KOH} C_6H_5-COO^{\ominus}K^{+} + C_6H_5-CH_2OH$$

$$D \xrightarrow[\Delta]{Ba(OH)_2} H_3C-\underset{CH_3}{\underset{|}{C}}=CH-\overset{O}{\overset{\|}{C}}-CH_3$$

(a) $C_6H_5-\overset{O}{\overset{\|}{C}}-CH_3$
(b) $C_6H_5-\overset{O}{\overset{\|}{C}}-CH(CH_3)_2$
(c) $C_6H_5-CH_2-\overset{O}{\overset{\|}{C}}-CH_3$
(d) $C_6H_5-\overset{O}{\overset{\|}{C}}-CH_2CH_3$

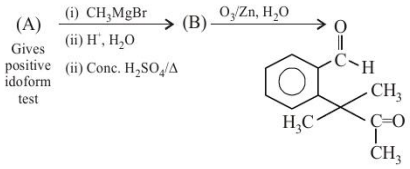
19. The increasing order of the following compounds towards HCN addition is : **[Sep. 02, 2020 (I)]**

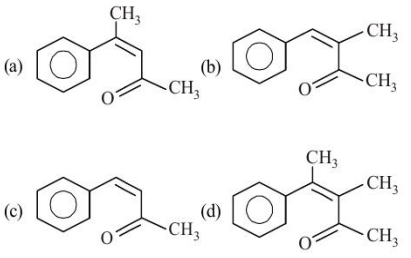


(i) (ii) (iii) (iv)

(a) (i) < (iii) < (iv) < (ii) (b) (iii) < (iv) < (i) < (ii)
(c) (iii) < (i) < (iv) < (ii) (d) (iii) < (iv) < (ii) < (i)

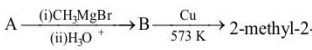
20. Identify (A) in the following reaction sequence: **[Jan. 09, 2020 (I)]**





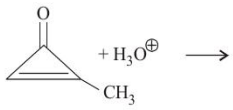
(a) (b) (c) (d)

21. Consider the following reactions

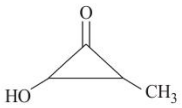


The mass percentage of carbon in A is _____.
[NV, Jan. 09, 2020 (II)]

22. The major product in the following reaction is: **[Jan. 08, 2020 (II)]**



(a)



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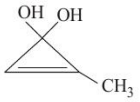

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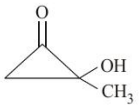

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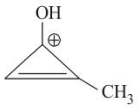
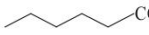


23. What is the product of following reaction?

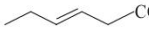
[Jan. 07, 2020 (I)]

(a)

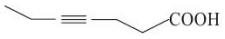


(b)

(c)

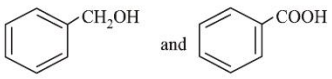


(d)

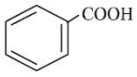


24. Major products of the following reaction are : **[April 10, 2019 (I)]**

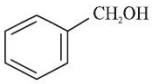
(a)



(b) CH_3OH and

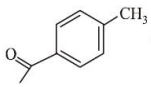


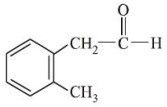
(c) HCOOH and

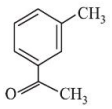


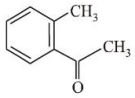
(d) CH_3OH and HCO_2H

25. Compound A($C_9H_{10}O$) shows positive iodoform test. Oxidation of A with $KMnO_4$/KOH gives acid B($C_8H_6O_4$). Anhydride of B is used for the preparation of phenolphthalein. Compound A is : **[April 10, 2019 (II)]**

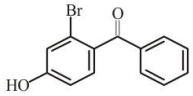
(a) 

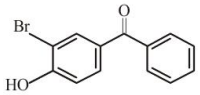
(b) 

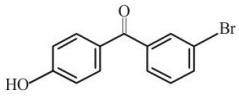
(c) 

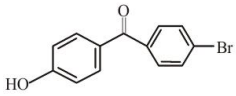
(d) 

26. p-Hydroxybenzophenone upon reaction with bromine in carbon tetrachloride gives: **[April 9, 2019 (II)]**

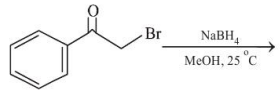
(a) 

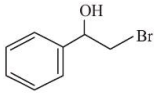
(b) 

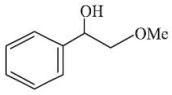
(c) 

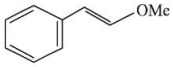
(d) 

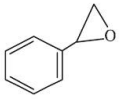
27. The major product of the following reaction is : **[April 8, 2019 (I)]**



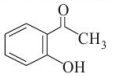
(a) 

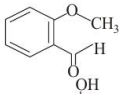
(b) 

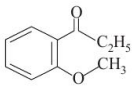
(c) 

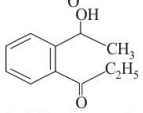
(d) 

28. An organic compound neither reacts with neutral ferric chloride solution nor with Fehling solution. It however, reacts with Grignard reagent and gives positive iodoform test. The compound is : **[April 8, 2019 (I)]**

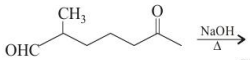
(a) 

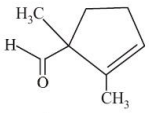
(b) 

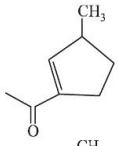
(c) 

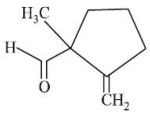
(d) 

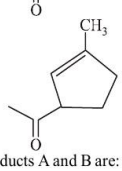
29. The major product obtained in the following reaction is : **[April 8, 2019 (II)]**



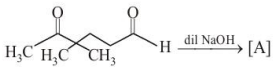
(a) 

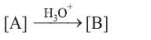
(b) 

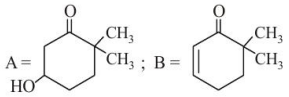
(c) 

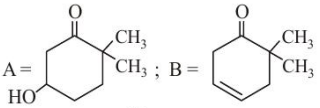
(d) 

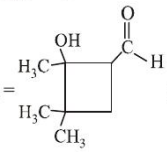
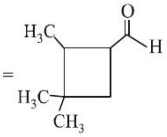
30. In the following reactions, products A and B are: **[Jan. 12, 2019 (I)]**

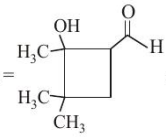
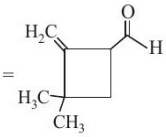




(a) 

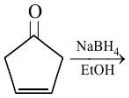
(b)  ; B =

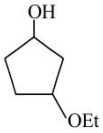
(c) A =  ; B = 

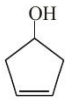
(d) A =  ; B = 

31. The major product of the following reaction is :

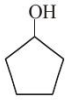
[Jan. 12, 2019 (II)]



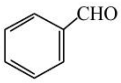
(a) 

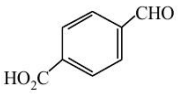
(b) 

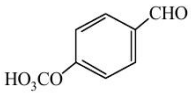
(c) 

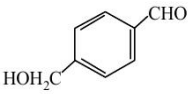
(d) 

32. The aldehydes which will **not** form Grignard product with one equivalent Grignard reagents are: **[Jan. 12, 2019 (II)]**

(A) 

(B) 

(C) 

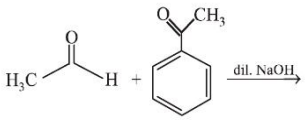
(D) 

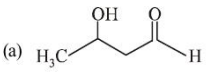
(a) (B), (D) (b) (B), (C)

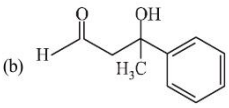
(c) (B), (C), (D) (d) (C), (D)

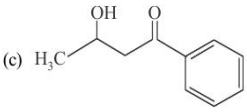
33. The major product formed in the following reaction is:

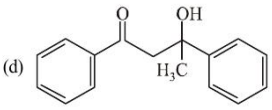
[Jan. 9, 2019 (II)]



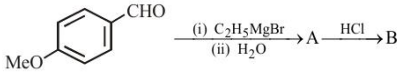
(a) 

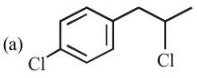
(b) 

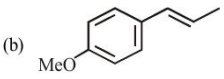
(c) 

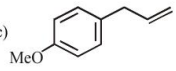
(d) 

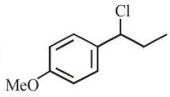
34. The major product B formed in the following reaction sequence is: **[Online April 16, 2018]**



(a) 

(b) 

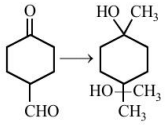
(c) 

(d) 

35. Which of the following compounds will most readily be dehydrated to give alkene under acidic condition?
[Online April 16, 2018]

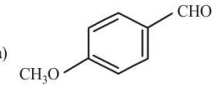
(a) 4-Hydroxypentan-2-one
(b) 3-Hydroxypentan-2-one
(c) 1-Pentanol
(d) 2-Hydroxycyclopentanone

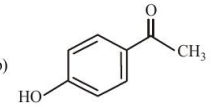
36. The correct sequence of reagents for the following conversion will be : **[2017]**

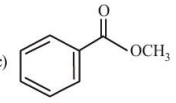


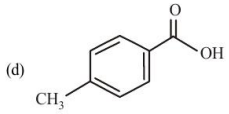
(a) $[Ag(NH_3)_2]^+OH^-, H^+/CH_3OH, CH_3MgBr$
(b) $CH_3MgBr, H^+/CH_3OH, [Ag(NH_3)_2]^+OH^-$
(c) $CH_3MgBr, [Ag(NH_3)_2]^+OH^-, H^+/CH_3OH$
(d) $[Ag(NH_3)_2]^+OH^-, CH_3MgBr, H^+/CH_3OH$

37. A compound of molecular formula $C_8H_8O_2$ reacts with acetophenone to form a single cross-aldol product in the presence of base. The same compound on reaction with conc. NaOH forms benzyl alcohol as one of the products. The structure of the compound is: **[Online April 9, 2017]**

(a) 

(b) 

(c) 

(d) 

38. The correct statement about the synthesis of erythritol $(C(CH_2OH)_4)$ used in the preparation of PETN is :
[Online April 10, 2016]

(a) Thy synthesis requires three aldol condensations and one Cannizzaro reaction.
(b) Alpha hydrogens of ethanol and methanol are involved in this reaction.
(c) The synthesis requires two aldol condensations and two Cannizzaro reactions.
(d) The synthesis requires four aldol condensations between methanol and ethanol.

39. In the reaction sequence **[Online April 11, 2015]**

$2CH_3CHO \xrightarrow{OH^-} A \xrightarrow{\Delta}$ B ; the product B is :

(a) $CH_3-CH_2-CH_2-CH_2-OH$
(b) $CH_3-CH=CH-CHO$
(c) $CH_3-CH_2-CH_2-CH_3$
(d) $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$

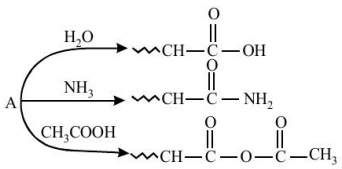
40. Which one of the following reactions will not result in the formation of carbon-carbon bond?
[Online April 9, 2014]

(a) Reimer-Tieman reaction (b) Friedel Craft's acylation
(c) Wurtz reaction (d) Cannizzaro reaction

41. Which is major product formed when acetone is heated with iodine and potassium hydroxide?
[Online April 9, 2014]

(a) Iodoacetone (b) Acetic acid
(c) Iodoform (d) Acetophenone

42. An organic compound A, C_5H_8O; reacts with H_2O, NH_3 and CH_3COOH as described below:
[Online April 11, 2014]



A is:

(a) $CH_3CH=\underset{\underset{CH_3}{|}}{C}-CHO$

(b) $CH_2=CH\,\underset{\underset{CH_3}{|}}{CH}-CHO$

(c) $CH_3 - CH_2 - \underset{\underset{CH_3}{|}}{C} = C = O$

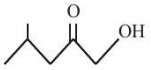
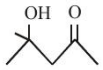
(d) $CH_3 - CH_2 - \underset{\underset{CH_2H}{||}}{C} - \underset{|}{C} = O$

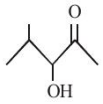
43. Tischenko reaction is a modification of:
(a) Aldol condensation **[Online April 11, 2014]**
(b) Claisen condensation
(c) Cannizzaro reaction
(d) Pinacol-pinacolon reaction

44. Formaldehyde can be distinguished from acetaldehyde by the use of : **[Online April 9, 2013]**
(a) Schiff's reagent (b) Tollen's reagent
(c) I_2/Alkali (d) Fehling's solution

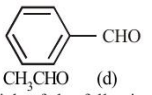
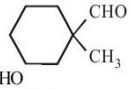
45. Clemmensen reduction of a ketone is carried out in the presence of : **[Online April 22, 2013]**
(a) $LiAlH_4$ (b) Zn-Hg with HCl
(c) Glycol with KOH (d) H_2 with Pt as catalyst

46. Which of the following is the product of aldol condensation? **[Online April 23, 2013]**

(a)  (b) 

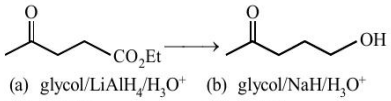
(c)  (d) 

47. Cannizaro's reaction is not given by : **[Online April 25, 2013]**

(a)  (b) 

(c) CH_3CHO (d) HCHO

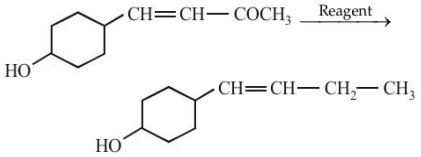
48. Which of the following reagent(s) is/are used for the conversion? **[Online April 25, 2013]**



(a) glycol/$LiAlH_4/H_3O^+$ (b) glycol/NaH/H_3O^+
(c) $LiA1H_4$ (d) $NaBH_4$

49. Iodoform can be prepared from all except : **[2012]**
(a) Ethyl methyl ketone (b) Isopropyl alcohol
(c) 3-Methyl 2-butanone (d) Isobutyl alcohol

50. In the given transformation, which of the following is the most appropriate reagent ? **[2012]**



(a) $NH_2NH_2, \overset{\ominus}{O}H$ (b) Zn – Hg/ HCl
(c) Na, Liq NH_3 (d) $NaBH_4$

51. Among the following the order of reactivity towards nucleophilic addition is **[Online May 7, 2012]**
(a) $CH_3CHO > CH_3COCH_3 > HCHO$
(b) $HCHO > CH_3CHO > CH_3COCH_3$
(c) $CH_3CHO > HCHO > CH_3COCH_3$
(d) $CH_3COCH_3 > CH_3CHO > HCHO$

52. The reaction, **[Online May 12, 2012]**

$$CH_3CHO \xrightarrow{Zn(Hg)/Conc.\ HCl\ [H]} CH_3CH_3 \text{ is}$$

(a) Cannizzaro's reaction (b) Rosenmund reduction
(c) Wolf-Kishner reduction (d) Clemmenson reduction

53. Tollen's reagent and Fehling solutions are used to distinguish between **[Online May 26, 2012]**
(a) acids and alcohols
(b) alkanes and alcohols
(c) ketones and aldehydes
(d) *n*-alkaens and branched alkanes

54. In Cannizzaro reaction given below

$$2PhCHO \xrightarrow{:\bar{O}H} PhCH_2OH + PhC\bar{O}_2$$

the slowest step is : **[2009]**
(a) the transfer of hydride to the carbonyl group
(b) the abstraction of proton from the carboxylic group
(c) the deprotonation of Ph CH_2OH
(d) the attack of : $\bar{O}H$ at the carboxyl group

55. The increasing order of the rate of HCN addition to compound A to D is **[2006]**
(A) HCHO (B) CH_3COCH_3
(C) $PhCOCH_3$ (D) PhCOPh
(a) D < C < B < A (b) C < D < B < A
(c) A < B < C < D (d) D < B < C < A

56. Reaction of cyclohexanone with dimethylamine in the presence of catalytic amount of an acid forms a compound if water during the reaction is continuously removed. The compound formed is generally known as **[2005]**
(a) an amine (b) an imine
(c) an enamine (d) a Schiff"s base

57. On mixing ethyl acetate with aqueous sodium chloride, the composition of the resultant solution is **[2004]**
(a) $CH_3COCl + C_2H_5OH + NaOH$
(b) $CH_3COONa + C_2H_5OH$
(c) $CH_3COOC_2H_5 + NaCl$
(d) $CH_3Cl + C_2H_5COONa$

58. Acetyl bromide reacts with excess of CH_3MgI followed by treatment with a saturated solution of NH_4Cl gives **[2004]**
(a) 2-methyl-2-propanol (b) acetamide
(c) acetone (d) acetyl iodide

59. Which one of the following is reduced with zinc amalgam and hydrochloric acid to give the corresponding hydrocarbon? **[2004]**

(a) Acetamide (b) Acetic acid
(c) Ethyl acetate (d) Butan-2-one

60. Which one of the following undergoes reaction with 50% sodium hyroxide solution to give the corresponding alcohol and acid? **[2004]**

(a) Butanal (b) Benzaldehyde
(c) Phenol (d) Benzoic acid

61. On vigorous oxidation by permanganate solution. **[2002]**

$(CH_3)_2C = CH - CH_2 - CHO$ gives

(a) $CH_3 - \underset{\underset{CH_3}{|}}{\overset{\overset{OH}{|}}{C}} - \overset{\overset{OH}{|}}{CH} - CH_2CHO$

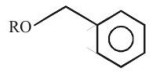
(b) $\begin{matrix} CH_3 \\ CH_3 \end{matrix}\!\!>\!C = O + HOOCCH_2COOH$

(c) $\begin{matrix} CH_3 \\ CH_3 \end{matrix}\!\!>\!C = O + OHCCH_2COOH$

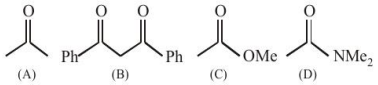
(d) $\begin{matrix} CH_3 \\ CH_3 \end{matrix}\!\!>\!C = O + OHCCH_2CHO$

TOPIC 3 Preparation and Properties of Carboxylic Acids and their Derivatives

62. Which of the following derivatives of alcohols is unstable in an aqueous base? **[Sep. 05, 2020 (I)]**

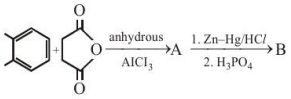
(a) 
(b) 
(c) 
(d) $RO - CMe_3$

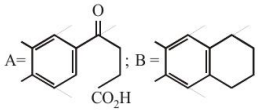
63. The increasing order of the acidity of the α-hydrogen of the following compounds is : **[Sep. 05, 2020 (I)]**

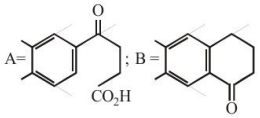

(A) (B) (C) (D)

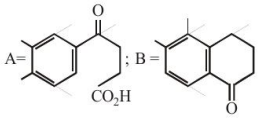
(a) (D) < (C) < (A) < (B) (b) (B) < (C) < (A) < (D)
(c) (A) < (C) < (D) < (B) (d) (C) < (A) < (B) < (D)

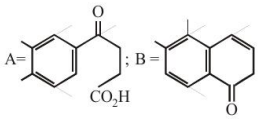
64. In the following reaction sequence the major products A and B are : **[Sep. 05, 2020 (I)]**



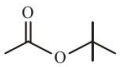
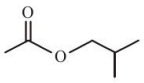
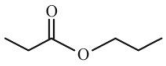
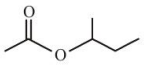
(a) A=  ; B =

(b) A=  ; B =

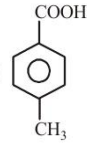
(c) A=  ; B =

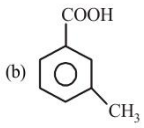
(d) A=  ; B =

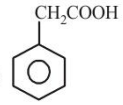
65. An organic compound (A) (molecular formula $C_6H_{12}O_2$) was hydrolysed with dil. H_2SO_4 to give a carboxylic acid (B) and an alochol (C). 'C' gives white turbidity immediately when treated with anhydrous $ZnCl_2$ and conc. HCl. The organic compound (A) is : **[Sep. 04, 2020 (I)]**

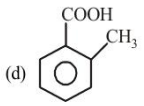
(a) 
(b) 
(c) 
(d) 

66. [P] on treatment with $Br_2/FeBr_3$ in CCl_4 produced a single isomer $C_8H_7O_2Br$ while heating [P] with sodalime gave toluene. The compound [P] is : **[Sep. 04, 2020 (I)]**

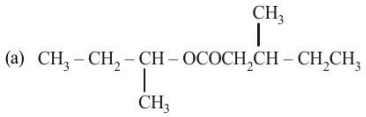
(a) 

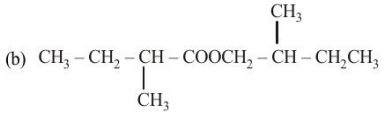
(b) 

(c) 

(d) 

67. An organic compound [A], molecular formula $C_{10}H_{20}O_2$ was hydrolyzed with dilute sulphuric acid to give a carboxylic acid [B] and an alcohol [C]. Oxidation of [C] with $CrO_3 - H_2SO_4$ produced [B]. Which of the following structures are not possible for [A]? **[Sep. 03, 2020 (I)]**

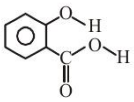
(a) 

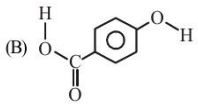
(b) 

(c) $CH_3CH_2CH_2COOCH_2CH_2CH_2CH_3$

(d) $(CH_3)_3 - C - COOCH_2C(CH_3)_3$

68. Consider the following molecules and statements related to them : **[Sep. 03, 2020 (II)]**

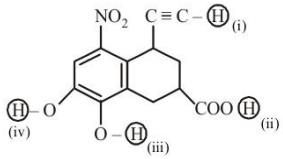
(A) 

(B) 

(1) (B) is more likely to be crystalline than (A)
(2) (B) has higher boiling point than (A)
(3) (B) dissolves more readily than (A) in water
Identify the **correct** option from below : **[Sep. 03, 2020 (II)]**

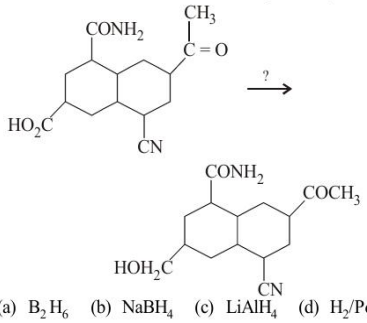
(a) (1) and (2) are true (b) (1) and (3) are true
(c) only (1) is true (d) (2) and (3) are true

69. Arrange the following labelled hydrogens in decreasing order of acidity : **[Sep. 02, 2020 (II)]**



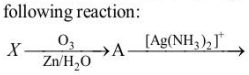
(a) (ii) > (i) > (iii) > (iv) (b) (iii) > (ii) > (iv) > (i)
(c) (ii) > (iii) > (iv) > (i) (d) (iii) > (ii) > (i) > (iv)

70. The most suitable reagent for the given conversion is: **[Jan. 08, 2020 (I)]**



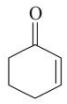
(a) B_2H_6 (b) $NaBH_4$ (c) $LiAlH_4$ (d) H_2/Pd

71. An unsaturated hydrocarbon *X* absorbs two hydrogen molecules on catalytic hydrogenation, and also gives following reaction:



B(3-oxo-hexanedicarboxylic acid)
X will be : **[Jan. 08, 2020 (II)]**

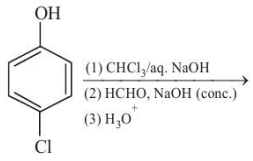
(a) 

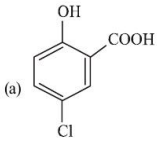
(b) 

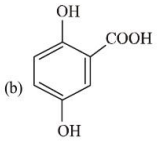
(c) 

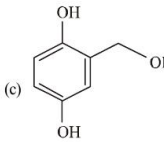
(d) 

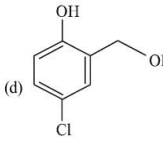
72. The major products of the following reaction are : **[April 12, 2019 (I)]**



(a)  and Methanol

(b)  and Methanol

(c)  and Formic acid

(d)  and Formic acid

73. The major product of the following reaction is:

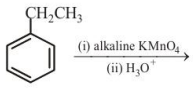
$CH_3CH=CHCO_2CH_3 \xrightarrow{LiAlH_4}$ **[April 9, 2019 (I)]**

(a) $CH_3CH_2CH_2CO_2CH_3$ (b) $CH_3CH=CHCH_2OH$

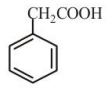
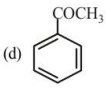
(c) $CH_3CH_2CH_2CH_2OH$ (d) $CH_3CH_2CH_2CHO$

74. The major product of the following reaction is:

[April 9, 2019 (I)]

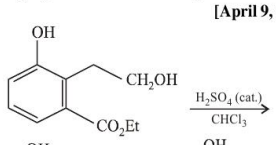


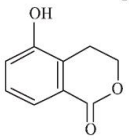
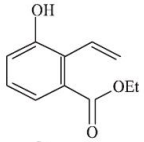
(a)  (b) 

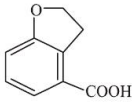
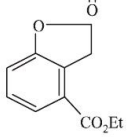
(c)  (d) 

75. The major product of the following reaction is:

[April 9, 2019 (II)]

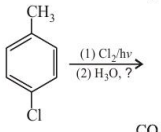


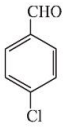
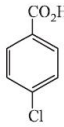
(a)  (b) 

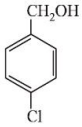
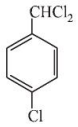
(c)  (d) 

76. The major product of the following reaction is:

[April 8, 2019 (II)]

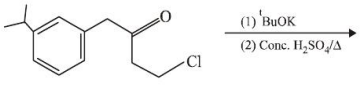


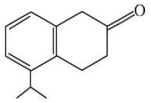
(a)  (b) 

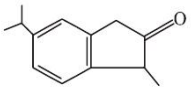
(c)  (d) 

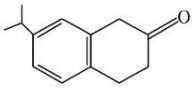
77. The major product of the following reaction is:

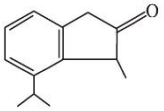
[April 8, 2019 (II)]



(a) 

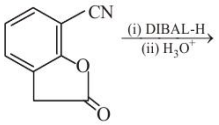
(b) 

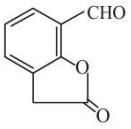
(c) 

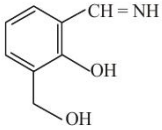
(d) 

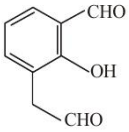
78. The major product of the following reaction is:

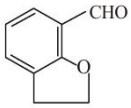
[Jan. 12, 2019 (I)]



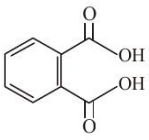
(a) 

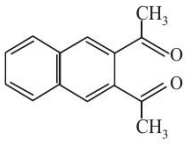
(b) 

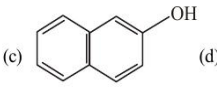
(c) 

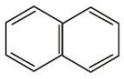
(d) 

79. Among the following four aromatic compounds ,which one will have the lowest melting point? **[Jan. 12, 2019 (I)]**

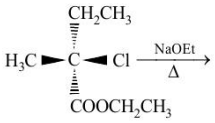
(a) 

(b) 

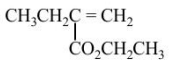
(c) 

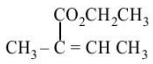
(d) 

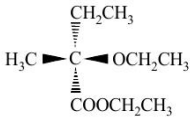
80. The major product of the following reaction is :

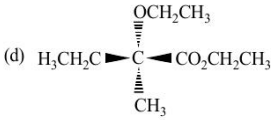


[Jan. 12, 2019 (II)]

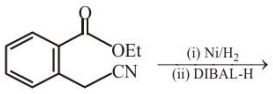
(a) 

(b) 

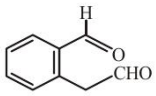
(c) 

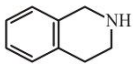
(d) 

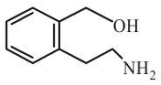
81. The major product of the following reaction is :

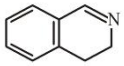


[Jan. 11, 2019 (I)]

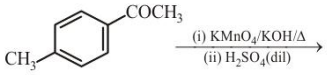
(a) 

(b) 

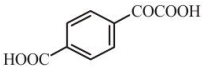
(c) 

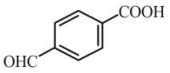
(d) 

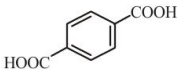
82. The major product of the following reaction is :

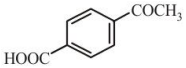


[Jan. 11, 2019 (I)]

(a) 

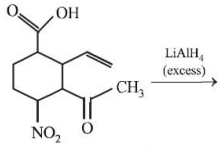
(b) 

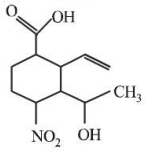
(c) 

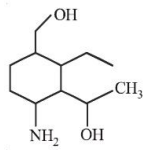
(d) 

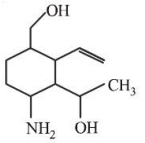
83. The major product obtained in the following reaction is:

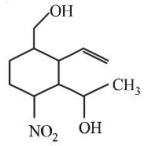
[Jan. 11, 2019 (II)]



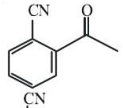
(a) 

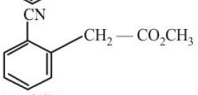
(b) 

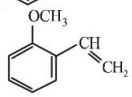
(c) 

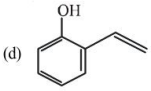
(d) 

84. Which of the following compounds reacts with ethylmagnesium bromide and also decolourizes bromine water solution? **[Jan. 11, 2019 (II)]**

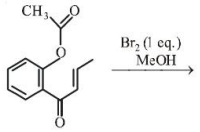
(a) 

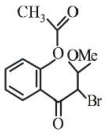
(b) 

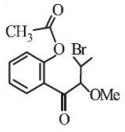
(c) 

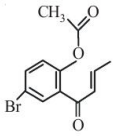
(d) 

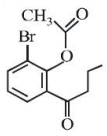
85. The major product obtained in the following conversion is: **[Jan. 11, 2019 (II)]**



(a) 

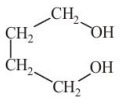
(b) 

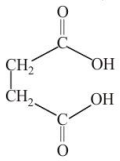
(c) 

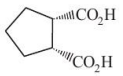
(d) 

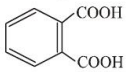
86. Which dicarboxylic acid in presence of a dehydrating agent is least reactive to give an anhydride?

[Jan. 10, 2019 (I)]

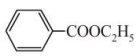
(a) 

(b) 

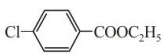
(c) 

(d) 

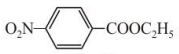
87. The decreasing order of ease of alkaline hydrolysis for the following esters is **[Jan. 10, 2019 (I)]**



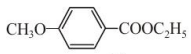
I



II



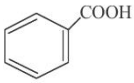
III

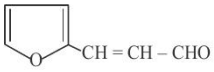


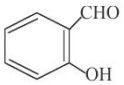
IV

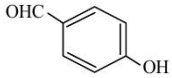
(a) III > II > IV > I (b) III > II > I > IV
(c) IV > II > III > I (d) II > III > I > IV

88. An aromatic compound 'A' having molecular formula $C_7H_6O_2$ on treating with aqueous ammonia and heating forms compound 'B'. The compound 'B' on reaction with molecular bromine and potassium hydroxide provides compound 'C' having molecular formula C_6H_7N. The structure of 'A' is: **[Jan. 10, 2019 (II)]**

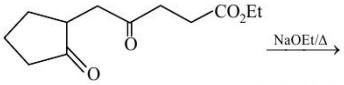
(a) 

(b) 

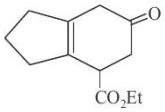
(c) 

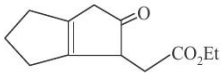
(d) 

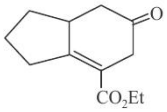
89. The major product obtained in the following reaction is:

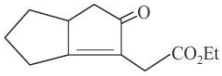


[Jan. 10, 2019 (II)]

(a) 

(b) 

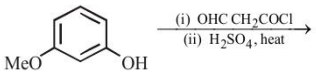
(c) 

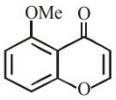
(d) 

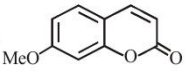
90. The correct decreasing order for acid strength is: **[Jan. 9, 2019 (I)]**

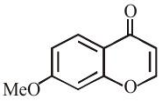
(a) $NO_2CH_2COOH > FCH_2COOH > CNCH_2COOH > ClCH_2COOH$
(b) $FCH_2COOH > CNCH_2COOH > NO_2CH_2COOH > ClCH_2COOH$
(c) $CNCH_2COOH > NO_2CH_2COOH > FCH_2COOH > ClCH_2COOH$
(d) $NO_2CH_2COOH > CNCH_2COOH > FCH_2COOH > ClCH_2COOH$

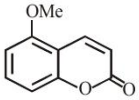
91. The major product of the given reaction: **[Online April 16, 2018]**



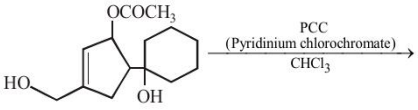
(a) 

(b) 

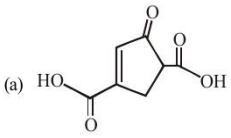
(c) 

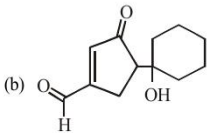
(d) 

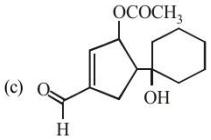
92. The major product formed in the following reaction is:

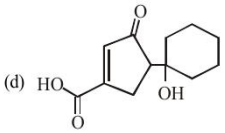


[Online April 15, 2018 (II)]

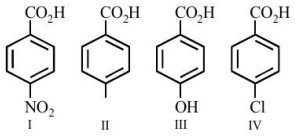
(a) 

(b) 

(c) 

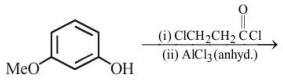
(d) 

93. The increasing order of the acidity of the following carboxylic acids is: **[Online April 15, 2018 (II)]**

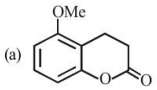
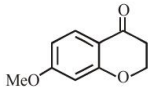
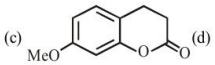
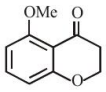


(a) III < II < IV < I (b) I < III < II < IV
(c) IV < II < III < I (d) II < IV < III < I

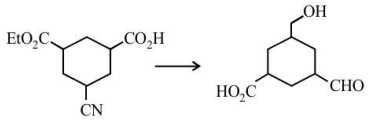
94. The major product of the following reaction is



[Online April 15, 2018 (I)]

(a) 
(b) 
(c) 
(d) 

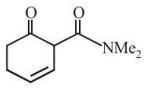
95. The reagent(s) required for the following conversion are :



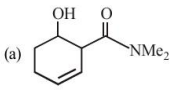
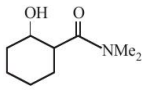
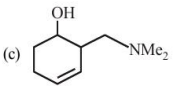
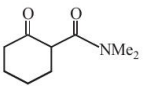
[Online April 15, 2018 (I)]

(a) (i) $NaBH_4$, (ii) Raney Ni/H_2, (iii) H_3O^+
(b) (i) $LiAlH_4$, (ii) H_3O^+
(c) (i) B_2H_6, (ii) DIBAL-H, (iii) H_3O^+
(d) (i) B_2H_6, (ii) $SnCl_2/HCl$, (iii) H_3O^+

96. The main reduction product of the following compound with $NaBH_4$ in methanol is :



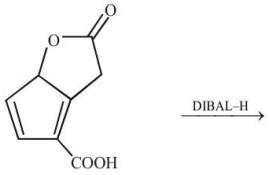
[Online April 15, 2018 (I)]

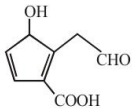
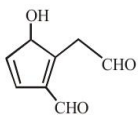
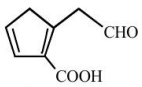
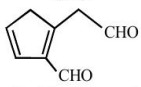
(a) 
(b) 
(c) 
(d) 

97. Sodium salt of an organic acid 'X' produces effervescences with conc. H_2SO_4. 'X' reacts with the acidified aqueous $CaCl_2$ solution to give a white precipitate which decolourises acidic solution of $KMnO_4$. 'X' is : **[2017]**

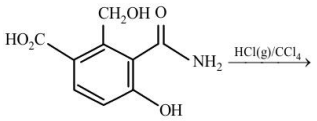
(a) C_6H_5COONa (b) HCOONa
(c) CH_3COONa (d) $Na_2C_2O_4$

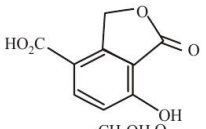
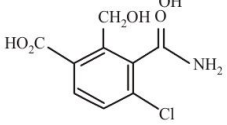
98. The major product obtained in the following reaction is : **[2017]**

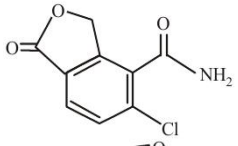


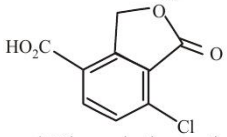
(a) 
(b) 
(c) 
(d) 

99. The major product expected from the following reaction is: **[Online April 8, 2017]**



(a) 
(b) 

(c) 

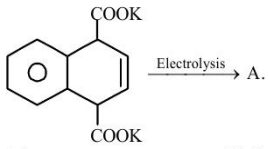
(d) 

100. Bouveault–Blanc reduction reaction involves : **[Online April 9, 2016]**

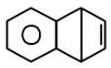
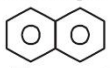
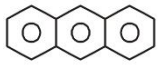
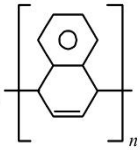
(a) Reduction of an acyl halide with H_2/Pd
(b) Reduction of an anhydride with $LiAlH_4$
(c) Reduction of an ester with Na/C_2H_5OH
(d) Reduction of a carbonyl compound with Na/Hg and HCl.

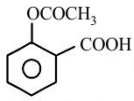
101. In the presence of a small amount of phosphorous, aliphatic carboxylic acids react with chlorine or bromine to yield a compound in which α-hydrogen has been replaced by halogen. This reaction is known as : **[Online April 10, 2015]**

(a) Wolff - Kishner reaction
(b) Rosenmund reaction
(c) Etard reaction
(d) Hell - Volhard - Zelinsky reaction

102.  A.

A is : **[Online April 10, 2015]**

(a) 
(b) 
(c) 
(d) 

103.  is used as : **[Online April 10, 2015]**

(a) Analgesic (b) Insecticide
(c) Antacid (d) Antihistamine

104. In the reaction,

$$CH_3COOH \xrightarrow{LiAlH_4} A \xrightarrow{PCl_5} B \xrightarrow{Alc.KOH} C,$$

the product C is: **[2014]**

(a) Acetaldehyde (b) Acetylene
(c) Ethylene (d) Acetyl chloride

105. Phthalic acid reacts with resorcinol in the presence of concentrated H_2SO_4 to give: **[Online April 12, 2014]**

(a) Phenolphthalein (b) Alizarin
(c) Coumarin (d) Fluorescein

106. An organic compound A upon reacting with NH_3 gives B. On heating B gives C. C in presence of KOH reacts with Br_2 to give $CH_3CH_2NH_2$. A is : **[2013]**

(a) CH_3COOH (b) $CH_3CH_2CH_2COOH$
(c) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-COOH$ (d) CH_3CH_2COOH

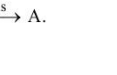
107. Monocarboxylic acids are functional isomers of: **[Online April 23, 2013]**

(a) Ethers (b) Amines
(c) Esters (d) Alcohols

108. A liquid was mixed with ethanol and a drop of concentrated H_2SO_4 was added. A compound with a fruity smell was formed. The liquid was : **[2009]**

(a) HCHO (b) CH_3COCH_3
(c) CH_3COOH (d) CH_3OH

109. The correct order of increasing acid strength of the compounds **[2006]**

(A) CH_3CO_2H (B) $MeOCH_2CO_2H$
(C) CF_3CO_2H (D) 

is

(a) D<A<B<C (b) A<D<B<C
(c) B<D<A<C (d) D<A<C<B

110. Among the following acids which has the lowest pK_a value? **[2005]**

(a) CH_3CH_2COOH (b) $(CH_3)_2CH-COOH$
(c) HCOOH (d) CH_3COOH

111. When $CH_2=CH-COOH$ is reduced with $LiAlH_4$, the compound obtained will be **[2003]**

(a) $CH_2=CH-CH_2OH$ (b) $CH_3-CH_2-CH_2OH$
(c) CH_3-CH_2-CHO (d) CH_3-CH_2-COOH

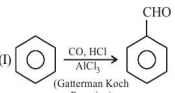
112. $CH_3CH_2COOH \xrightarrow[\text{red P}]{Cl_2} A \xrightarrow{\text{alc. KOH}} B.$ What is *B*? **[2002]**

(a) CH_3CH_2COCl (b) CH_3CH_2CHO
(c) $CH_2=CHCOOH$ (d) $ClCH_2CH_2COOH$.

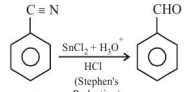
Hints & Solutions

1. **(d)** $CH_3-\underset{\underset{OSO_2CH_3}{|}}{CH}-CH-CH_3 \xrightarrow{KO^tBu/\Delta} CH_3-\underset{\underset{OSO_2CH_3}{|}}{CH}-CH=CH_2$

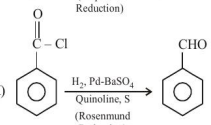
$CH_3-\underset{\underset{OSO_2CH_3}{|}}{CH}-CH=CH_2 \xrightarrow[\text{(oxidative ozonolysis)}]{\text{(II) } O_3/H_2O_2} CH_3-\underset{\underset{OSO_2CH_3}{|}}{CH}-COOH + HCOOH$

2. **(c)** (I) 

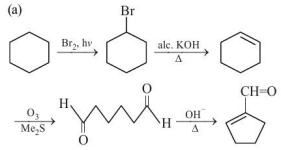
(Gatterman Koch Reaction)

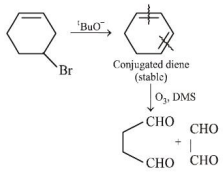
(II) 

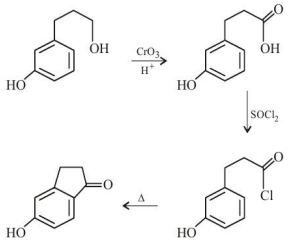
(Stephen's Reduction)

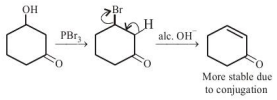
(III) 

(Rosenmund Reduction)

3. (a) 

4. **(a)** 

5. **(b)** 

6. **(c)** 

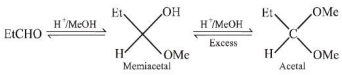
More stable due to conjugation

7. **(c)** $\underset{\text{(Acetone)}}{CH_3-\overset{\overset{O}{\|}}{C}-CH_3}$ $\underset{\text{(Propanal)}}{CH_3-CH_2-CHO}$

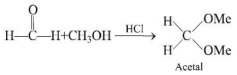
Generally, aldehydes are more reactive than ketones in nucleophilic addition reactions.

$\therefore$ Rate of reaction with alcohol to form acetal and ketal is

$\underset{\text{(Propanal)}}{CH_3-CH_2-CHO} > \underset{\text{(Acetone)}}{CH_3-\overset{\overset{O}{\|}}{C}-CH_3}$



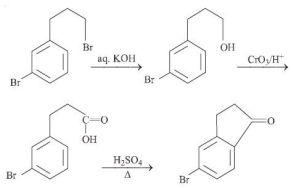
8. **(b)** Best combination is HCHO (more reactive aldehyde) and MeOH (less sterically hindered alcohol).

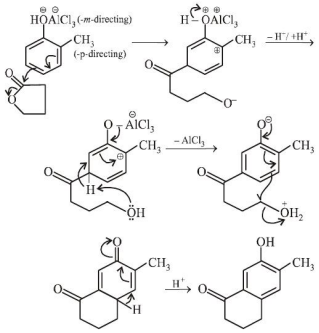


9. **(c)** $R-C\equiv N \xrightarrow[(ii)\ H_2O]{(i)\ AlH(i\text{-}Bu)_2} R-CHO$

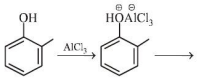
The reduction of nitriles to aldehydes can be done using DIBAL-H[AlH(i-Bu)$_2$].

10. **(a)** For the given reaction condition, the major product is:

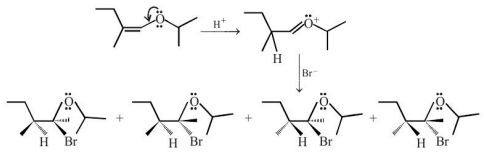




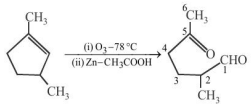
11. **(c)** Reaction involved:



12. **(c)** The total number of optically active compounds formed is four. The product has two chiral C atoms. Thus, it has $2^n = 2^2 = 4$ stereoisomers.



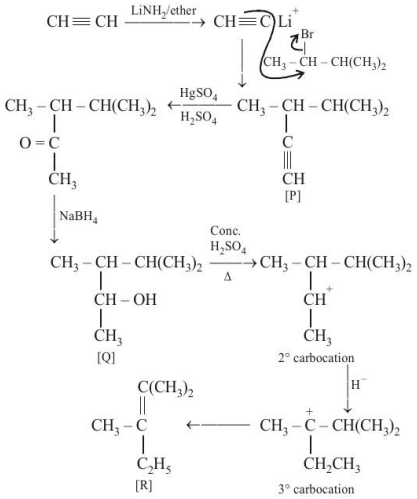
13. **(d)**



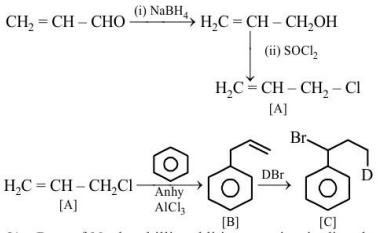
5-Keto-2-methylhexanal

14. **(c)** $CH_3CHCl_2 \xrightarrow{aq.KOH} CH_3CH(OH)_2 \xrightarrow{-H_2O} CH_3CHO$

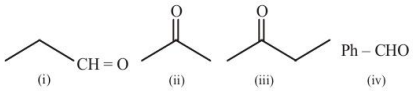
15. (c)



16. (a)

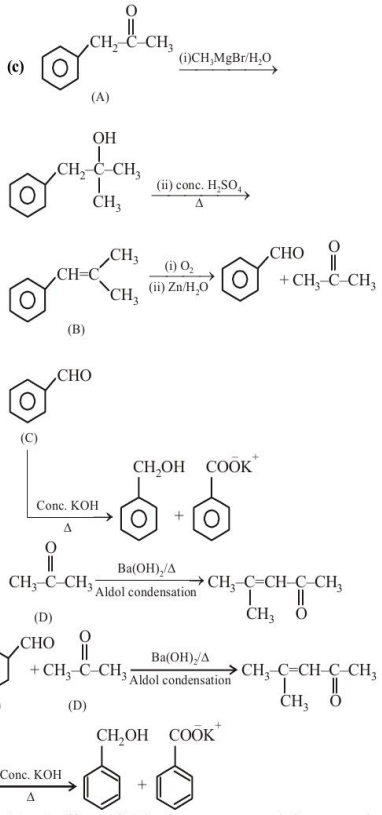


17. (b) Rate of Nucleophillic addition reaction is directly proportional to the –I and –M effect of the substituents present in the substrate. Ketones are less susceptible to the nucleophillic addition, due to the presence of alkyl (R) group which has +I effect. Thus reactivity order is



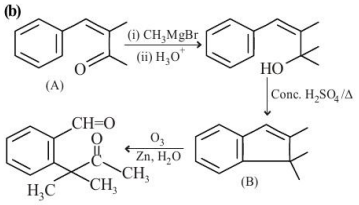
(i) > (iv) > (ii) > (iii)

18. (c)

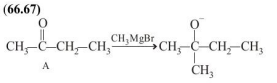


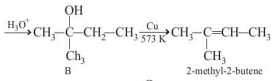
19. (c) –I effect of NO_2 increases reactivity towards nucleophilic addition reaction with HCN. $-OCH_3$ group is electron donating due to resonance effect which decreases the reactivity towards nucleophillic addition.

20. (b)



21. **(66.67)**



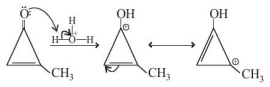


Compound A is $CH_3-\overset{O}{\overset{\|}{C}}-CH_2-CH_3 (C_4H_8O)$

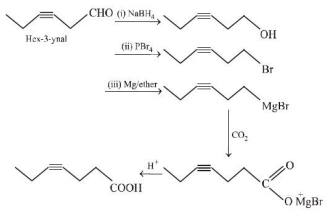
Mass percentage of carbon

$$= \left(\frac{12\times 4}{48+16+8}\times 100\right) = 66.67$$

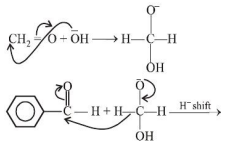
22. **(d)**

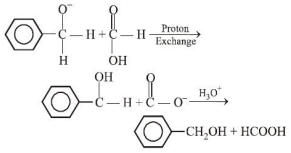


23. (d)



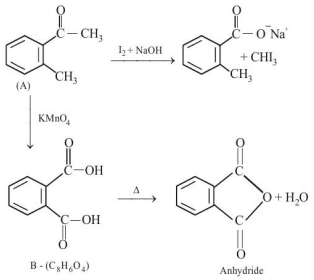
24. **(c)**



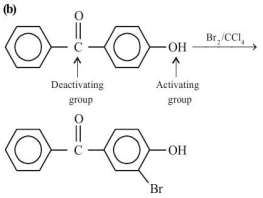


25. **(d)** (i) Since compound *A* ($C_9H_{10}O$) contains relatively very low H as compared to C, so it must contain a benzene ring.

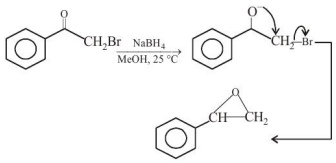
(ii) Further the oxidation product *B* ($C_8H_6O_4$) of *A* is a dicarboxylic acid which forms anhydride on heating, hence the acid is phthalic acid which is further comfirmed by the fact that it is used in the preparation of phenolphthalein when condensed with phenol in presence of conc. H_2SO_4. So the given compound *A* corresponds to option (4).



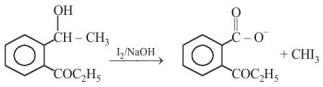
26. **(b)**



27. **(d)**

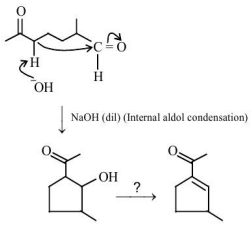


28. **(d)**

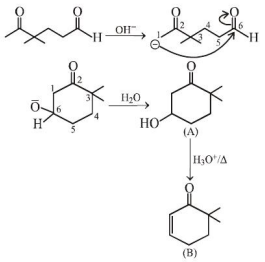


Test	Observation	Reason
Reaction with Grignard reagent	+ve	Electrophilic centre or acidic hydrogen is present
Fehling solution test	–ve	CHO group is absent
Neutral $FeCl_3$ test	–ve	phenolic group is absent
Iodoform test	+ve	$-COCH_3$ or $-CH(OH)-CH_3$ is present

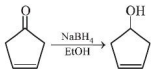
29. **(b)**



30. **(a)**

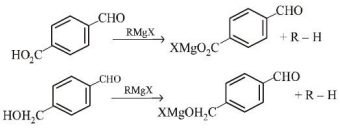


31. **(b)**

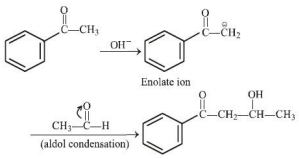


$NaBH_4$ does not reduce the double bond but can reduce keto group ($\rangle C = O$) into —OH group.

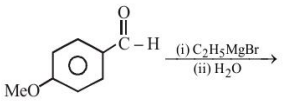
32. **(a)** Grignard reagent will not react with aldehydes if it has a functional group which contains acidic hydrogen. Thus options (B) and (D) have —COOH and $—CH_2OH$ respectively which contain acidic H-atom. Therefore, acid-base reaction occurs.

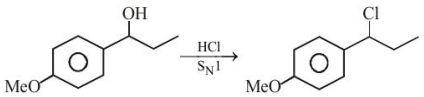


33. (3) Reaction mechanism involved:



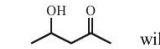
34. **(d)**





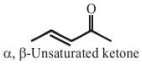
(A) (B)

35. **(a)**



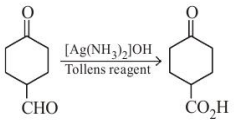
4-Hydroxypentan-2-one
(a)

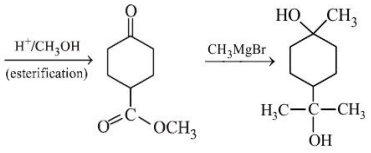
will most readily be dehyderated to give unsaturated ketone



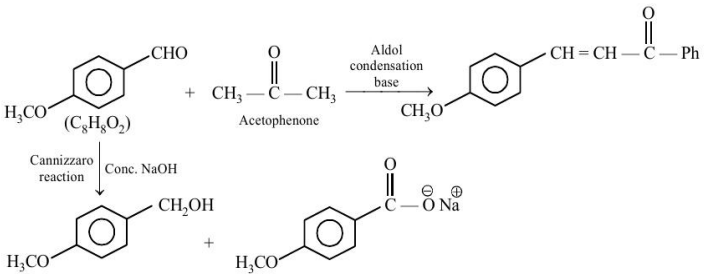
α, β-Unsaturated ketone

36. **(a)**





37. **(a)**



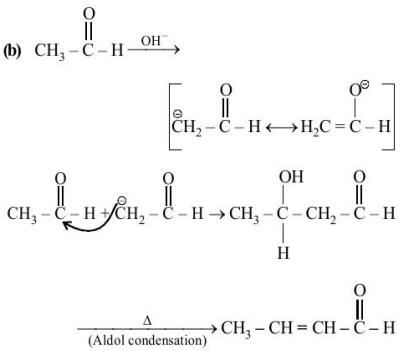
38. **(a)** The pentaerythritol is typically produced via a base-catalyzed reaction of acetaldehyde with excess formaldehyde. The aldol condensation of three moles of formaldehyde with one mole of acetaldehyde is followed by a crossed Cannizzaro reaction between pentaerythritol, the intermediate product, and formladehyde to give the final pentaerythritol product and sodium formate as a byproduct. These reactions are shown below

$$CH_3CHO \xrightarrow[\text{(three Aldol condensation)}]{3HCHO/OH^-} C(CH_2OH)_3CHO$$

$$C(CH_2OH)_3CHO \xrightarrow[OH^-]{HCHO} C(CH_2OH)_4 + HCOONa$$

(Cannizaro's reaction)

39. **(b)**



40. **(d)** Cannizzaro's reaction is a disproportionation reaction of aldehyde in which one molecule of aldehyde reduces to alcohol whereas other oxidises to salt of carboxylic acid

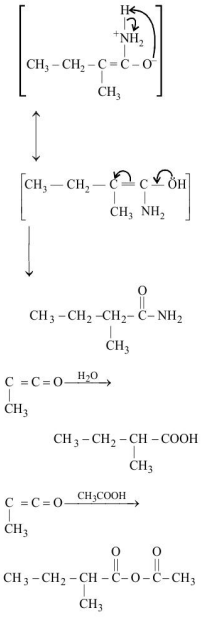
$$C_6H_5CHO + KOH \longrightarrow C_6H_5CH_2OH + C_6H_5COOK$$

41. **(c)** $CH_3COCH_3 + 3I_2 + 4KOH \longrightarrow CHI_3 + CH_3COOK + 3HI + 3H_2O$

42. **(c)** Given compound A is $CH_3-CH_2-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{C}}=C=O$

Reactions given are as following :

$$CH_3-CH_2-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{C}}=C=O \xrightarrow{NH_3}$$



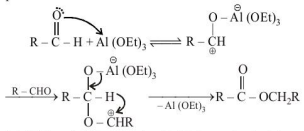
$$CH_3-CH_2-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{C}}=C=O \xrightarrow{H_2O}$$

$$CH_3-CH_2-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{CH}}-COOH$$

$$CH_3-CH_2-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{C}}=C=O \xrightarrow{CH_3COOH}$$

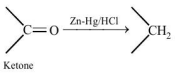
$$CH_3-CH_2-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{CH}}-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-CH_3$$

43. **(c)** Tishchenko reaction is a modification of Cannizzaro's reaction. This reaction involves disproportionation of an aldehyde lacking a hydrogen atom in the alpha position in the presence of an alkoxide. The reaction product is an ester. Catalysts are aluminium alkoxide or sodium alkoxide. In Cannizzaro's reaction the base is sodium hydroxide and the oxidation product is a carboxylic acid and the reduction product is an alcohol.



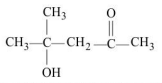
44. **(c)** Only acetaldehyde and methyl ketones give iodoform test.

45. **(b)**



Ketone

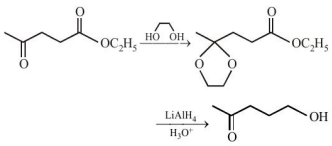
46. **(b)** $CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{C}}=O + CH_3COCH_3 \xrightarrow{OH^-}$



4−Hydroxy−4−methyl−2−pentanone

47. **(c)** Only those aldehydes which do not have α-H atom undergo Cannizaro's reaction. Hence CH_3CHO will not undergo Cannizaro's reaction as it has 3 α H atoms.

48. **(a)**



49. **(d)** Iodoform test is given by methyl ketones, acetaldehyde and methyl secondary alcohols.

Isobutyl alcohol is a primary alcohol except ethanol, C_2H_5OH, primary alcohols do not give haloform test.

Hence does not give positive iodoform test.

$$CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{CH}}-CH_2-OH$$

50. **(a)** Aldehydes and ketones can be reduced to hydrocarbons by the action (i) of amalgamated zinc and concentrated hydrochloric acid (Clemmenson reduction), or (ii) of hydrazine (NH_2NH_2) and a strong base like NaOH, KOH or potassium *tert*-butoxide in a high-boiling alcohol like ethylene glycol or triethylene glycol (Wolf-Kishner reduction) –OH group is acid-sensitive, so Clemmenson reduction can not be used.

51. **(b)** Presence of alkyl group in carbonyl compounds decreases their reactivity towards nucleophilic addition. Further greater the number of such groups lesser will be the reactivity towards nucleophilic addition, thus correct order is

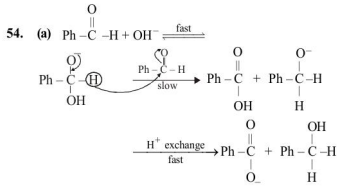
$HCHO > CH_3CHO > CH_3COCH_3$

52. **(d)** The reaction given is a Clemmenson reduction.

53. **(c)** All aldehydes show reaction with Tollen's reagent and Fehling solutions, but ketones do not show this reaction.

Note :- Benzaldehyde do not give reaction with Fehling solution.

54. **(a)**



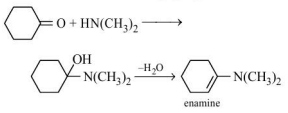
55. **(a)** **Note:** Addition of HCN to carbonyl compounds is nucleophilic addition reaction. The order of reactivity of carbonyl compounds is

Aldehydes (smaller to higher) > Ketones (smaller to higher). Therefore,

$HCHO > CH_3COCH_3 > PhCOCH_3 > PhCOPh$

Note: The lower reactivity of ketones is due to presence of two alkyl group which show +I effect. The reactivity of ketones decreases as the size of alkyl group increases.

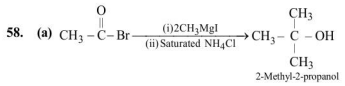
56. **(c)**



enamine

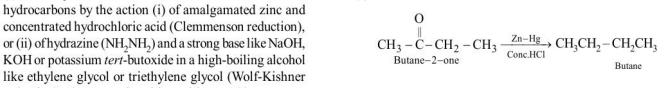
57. **(c)** There is no reaction hence the resultant mixture contains $CH_3COOC_2H_5 + NaCl$.

58. **(a)**



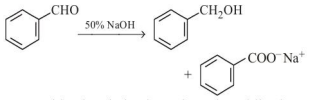
2-Methyl-2-propanol

59. **(d)** It is Clemmensen's reduction



Butane–2–one Butane

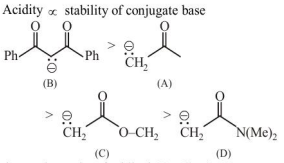
60. **(b)** This reaction is known as cannizzaro's reaction. In this reaction benzaldehyde in presence of 50%. NaOH undergoes disproportionation reaction and form one mol of benzyl alcohol (reduced product) and one mole of sod. benzoate (oxidation product)



61. **(b)** Double bond is leaved and oxidised to –COOH, –CHO is also oxidised to –COOH

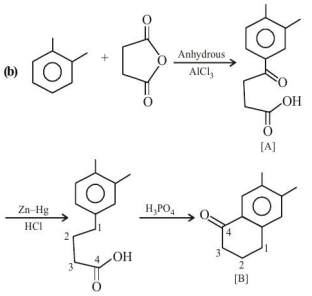
62. **(a)** Esters are hydrolysed in basic medium (saponification), so it is unstable in aqueous base.

63. **(a)** Acidity $\propto$ stability of conjugate base

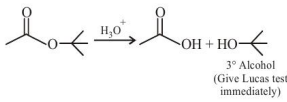


Thus increasing order of acidity is D < C < A < B.

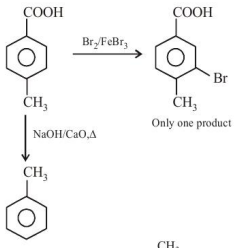
64. **(b)**



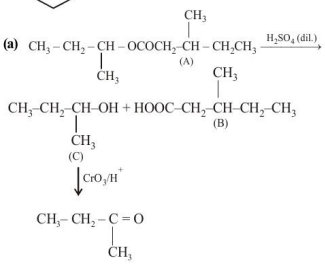
65. **(a)**



66. **(a)**



67. **(a)**



68. **(a, b, d)** Molecule (A) shows intramolecular H-bonding while molecule (B) shows intermolecular H-bonding. Due to presence of intermolecular H-bonding it has more b. pt. than molecule (A). Molecule (B) also shows intermolecule H-bonding with water which makes it more soluble than A. (B) is crystalline solid while (A) is liquid at room tempertature because of weaker intramolecular hydrogen bonding.

69. **(c)** Acidic strength $\propto$ Stability of conjugate base

General order of acidic strength is

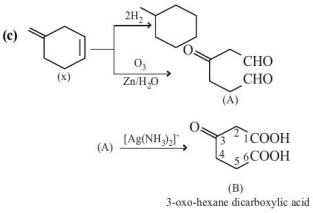
R–COOH > Ph–OH > R–C≡CH

In between (iii) and (iv), (iii) is more acidic due to –M effect of $-NO_2$.

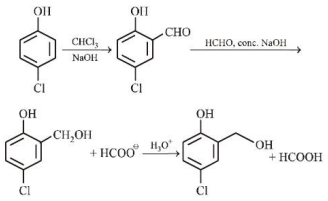
Thus, decreasing order of acidity is (ii) > (iii) > (iv) > (i).

70. **(a)** B_2H_6 is a very selective reducing agent and usually used to reduce acid to alcohol.

71. **(c)**



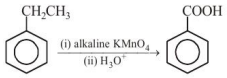
72. **(d)**



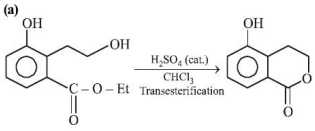
73. **(b)** $LiAlH_4$ reduces esters to alcohols but does not reduce C=C.

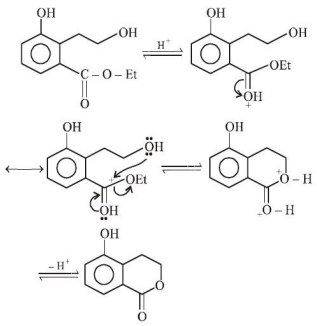
$CH_3CH=CH-CO_2Me \xrightarrow{LiAlH_4} CH_3CH=CHCH_2OH$

74. **(a)** Alkaline $KMnO_4$ converts  with a benzylic hydrogen into benzoic acid.

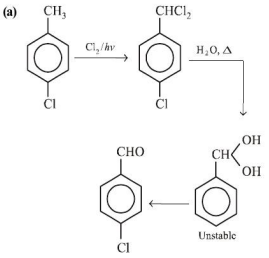


75. **(a)**

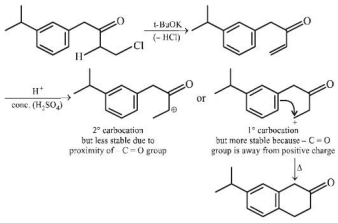




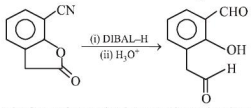
76. **(a)**



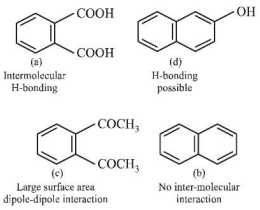
77. **(c)**



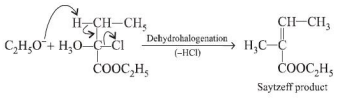
78. **(c)** Dissobutyl aluminium hydride, commonly abbreviated as DIBAL-H is a reducing agent for some specific functional groups. It reduces – C ≡ N to – CH = NH (amines) which are easily hydrolysed to – CHO. It also reduces lactones to aldehydes.



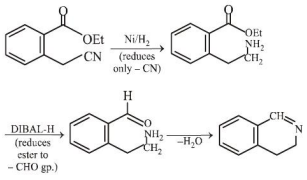
79. **(d)** The force of attraction between the molecules affects the melting point of a compound. Polarity increases the intermolecular force of attraction and as a result increases the melting point.



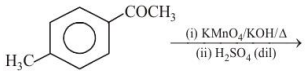
80. **(b)** Heating of the given compound in presence of strong base is favoured for elimination reaction resulting in more stable alkene.

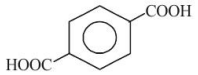


81. **(d)**

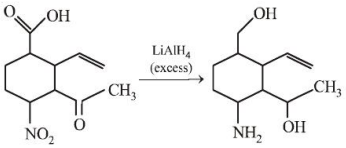


82. **(c)** Alkaline $KMnO_4$ is a strong oxidising agent and oxidises $– CH_3$ as well as – CO group to – COOH.



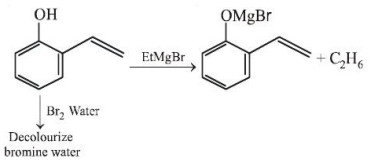


83. **(c)**

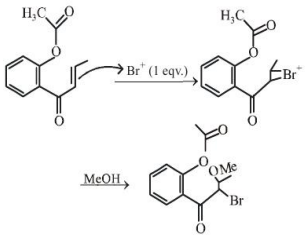


$LiAlH_4$ is a nucleophilic reducing agent, hence it will reduce – COOH to CH_2OH, – CO to – CHOH and – NO_2 to NH_2 but does not reduce C = C linkage.

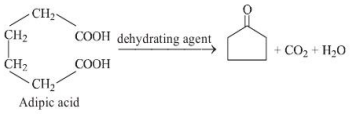
84. **(d)**



85. **(a)**

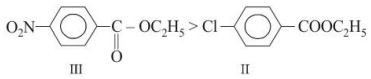


86. **(a)**

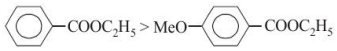


Adipic acid does not form anhydride.

87. **(b)** Rate of reaction ∝ Electrophillicity of carbonyl carbon, so E.W.G. increases the rate, while E.R.G. decreases the rate



III II

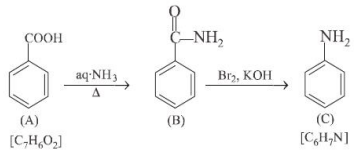


I IV

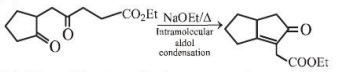
88. **(a)** $\underset{(C_7H_6O_2)}{A} \xrightarrow[\text{(ii) heat}]{\text{(i) Aq. } NH_3} B \xrightarrow{Br_2 / KOH} \underset{(C_6H_7N)}{C}$

going backward, compound C is obtained from B by Br_2 and KOH (Hoffmann bromamide reaction), so B must be an amide (– $CONH_2$) and C an amine – NH_2 or C_6H_5 – NH_2. Thus A should be benzoic acid, C_6H_5 – COOH or $C_7H_6O_2$.

Reaction involved:



89. **(d)** Reaction involved:

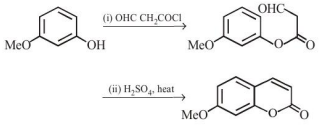


90. **(d)** The acidic strength of a compound or an acid depends on the inductive effect (–I). Higher the (–I) effect of a substituent higher will be acidic strength. Now, the decreasing order of (–I) effect of the given substituents is $NO_2 > CN > F > Cl$.

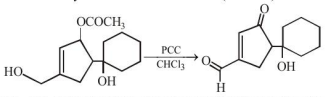
∴ The correct decreasing order of acidic strength amongst the given carboxylic acids is:

$NO_2CH_2COOH > CNCH_2COOH > FCH_2COOH > ClCH_2COOH$

91. **(b)** Acid chloride is more reactive than aldehyde. Hence, phenolic – OH will react with –COCl group first to form ester. This is followed by cyclisation in presence of conc. sulfuric acid.



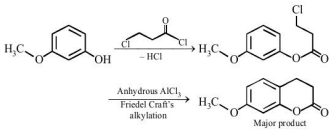
92. **(b)** PCC oxidizes primary alcohols to aldehydes and secondary alcohols to ketones.
In the above reaction, $-OCOCH_3$ group is hydrolyzed to secondary alcohol which is then oxidised (with PCC) to ketone.



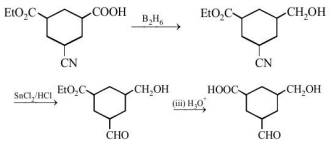
93. **(a)** The increasing order of the acidity of the carboxylic acids is III < II < IV < I. In aromatic acids, electron withdrawing groups like –Cl, –CN, $-NO_2$ increases the acidity, whereas electron releasing groups like $-CH_3$, –OH, $-OCH_3$, $-NH_2$ decreases the acidity.

94. **(c)** Since acid chloride is more reactive than alkyl halide, so COCl group will react first.

In the second step, Friedel Craft's alkylation occurs in a position that is ortho to alkoxy group and para to methoxy group. Both methoxy and alkoxy groups are ortho para directing groups.



95. **(c)**



96. **(a)** Sodium borohydride reduces ketonic group to alcohol, but not the amide group and C = C double bond.

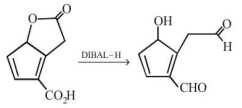
97. **(d)** $Na_2C_2O_4 + H_2SO_4 \rightarrow Na_2SO_4 + CO\uparrow + CO_2\uparrow + H_2O$
'X' (conc.)

$Na_2C_2O_4 + CaCl_2 \rightarrow CaC_2O_4\downarrow + 2NaCl$
'X' (white ppt.)

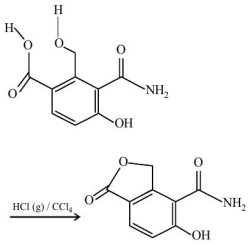
$5CaC_2O_4\downarrow + 2KMnO_4 + 8H_2SO_4 \rightarrow$
(purple)

$K_2SO_4 + 5CaSO_4 + 2MnSO_4 + 10CO_2 + 8H_2O$
(colourless)

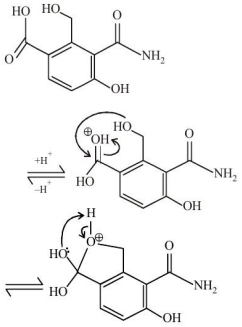
98. **(b)** DIBAL-H is a reducing agent. It reduces both ester and carboxylic group into an aldehyde at low temperature.

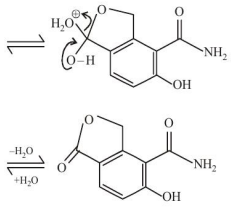


99. **(c)**



Mechanism :





100. **(c)** The Bouveault reduction is a reaction in which an ester is reduced to primary alcohol using absolute ethanol and sodium.

$$R-\overset{O}{\overset{\|}{C}}-OR \xrightarrow{Na/C_2H_5OH} RCH_2OH + ROH$$

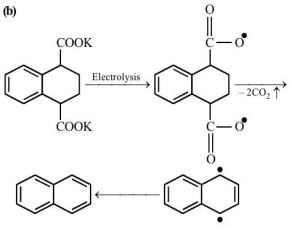
Bouveault-Blanc reduction.

101. **(d)** α-Substitution is occaured when a carboxylic acid having α-hydrogens is treated with chlorine or bromine in presence of small amount of red phosphorous. This reaction is commonly known as HVZ reaction.

$$R-CH_2COOH + X_2 \xrightarrow{P}$$

$$R\underset{X}{C}H-COOH + HX (X = Cl, Br)$$

102. **(b)**



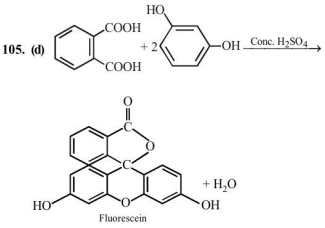
Stable due to aromatic character

103. **(a)** Drugs which relieve pain are called analgesics drugs. Analgesics are of two types (i) Narcotics and (ii) Non-narcotics. Aspirin (acetylsalicylic acid) is a non-narcotic analgesic.

104. **(c)** $CH_3COOH \xrightarrow{LiAlH_4} \underset{(A)}{CH_3CH_2OH}$

$$\xrightarrow{PCl_5} \underset{(B)}{CH_3CH_2Cl} \xrightarrow[\text{Alc. KOH}]{} \underset{(C)}{CH_2=CH_2}$$

105. **(d)**



Fluorescein

106. **(d)** $A \xrightarrow[(I)]{NH_3} B \xrightarrow[II]{\Delta} C \xrightarrow[KOH,(III)]{Br_2} CH_3CH_2NH_2$

Reaction (III) is a Hofmann bromamide reaction. Hence, C should be $CH_3CH_2CONH_2$, which can be obtained from $CH_3CH_2COO^-NH_4^+$(B).

Thus (A) should be CH_3CH_2COOH

$$\underset{(A)}{CH_3CH_2-COOH} \xrightarrow{NH_3} \underset{(B)}{CH_3CH_2COO^-NH_4^+}$$

$$\xrightarrow{\Delta} \underset{(C)}{CH_3CH_2CONH_2} \xrightarrow[KOH]{Br_2} CH_3CH_2NH_2$$

107. **(c)** Mono-carboxylic acids are functional isomers of esters. e.g.,

$\underset{\text{Acetic acid}}{CH_3COOH}$ $\underset{\text{Methyl formate}}{HCOOCH_3}$

108. **(c)** Fruity smell is due to ester formation which is formed between ethanol and acid.

$$CH_3COOH + C_2H_5OH \xrightarrow{Conc.\,H_2SO_4} CH_3COOC_2H_5 + H_2O$$

109. **(a)** The correct order of increasing acid strength is $(Me)_2CHCOOH < CH_3COOH < MeOCH_2COOH < CF_3COOH$

Note: Electron withdrawing groups increase the acid strength whereas electron donating groups decrease the acid strength.]

110. **(c)** $pK_a = -\log K_a$; HCOOH is the strongest acid and hence it has the highest K_a or lowest pK_a value.

111. **(a)** $LiAlH_4$ can reduce COOH group but not the double bond.

$$CH_2=CH-COOH \xrightarrow{LiAlH_4} CH_2=CH-CH_2OH$$

112. **(c)** $CH_3CH_2COOH \xrightarrow[\text{red P}]{Cl_2} CH_3CHClCOOH$

$$\xrightarrow[-HCl]{\text{alc.KOH}} \underset{\text{Acrylic acid}}{CH_2=CHCOOH}$$