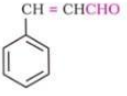
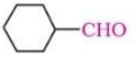
Chapter 6

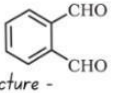
ALDEHYDES, KETONES AND CARBOXYLIC ACIDS

ALDEHYDES AND KETONES

INTRODUCTION

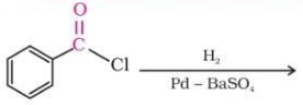
1. Vanillin structure -
2. Salicylaldehyde structure -
3. Name the structure - 

4. Benzophenone structure -
5. Name this structure - 

6. Draw 3-Oxopentanal.
7. Pentane-1,5-dial structure -
8. Draw propane-1,2,3-tricarbaldehyde.
9. Valeraldehyde structure -
10. Acrolein structure -
11. Name the structure - 

12. Isophthalaldehyde structure -
13. Terephthaldehyde structure -
14. Mesityl oxide formula -
15. Acetaldehyde formula -
16. Formaldehyde formula -

PREPARATION OF ALDEHYDES AND KETONES

17. 

(NEET)
18. Above reaction is called -
19. Write Wacker process reaction - (NEET)
20. RCN + SnCl2 + HCl → A + H3O+ → RCHO. Find A. (NEET)

21. Reaction in the previous question is called -

22. DIBAL-H full form is -

23. DIBAL-H do not attack on double bond because -

24. $RCN \xrightarrow[2.\ H_2O]{1.\ AlH(i\text{-}Bu)_2}$

25. $CH_3 - CH{=}CH\text{-}CH_2CH_2\text{-}CN \xrightarrow[2.]{1.} CH_3 - CH{=}CH\text{-}CH_2CH_2\text{-}CHO$

26. $CH_3(CH_2)_9 - \overset{\overset{O}{\|}}{C} - OC_2H_5 \xrightarrow[2.\ H_2O]{1.\ DIBAL\text{-}H}$

27.  $+ CrO_2Cl_2 \xrightarrow{CS_2}$? $\xrightarrow{H_3O^+}$? (NEET)

28. Above reaction is called - (NEET)

29.  $+ CrO_3 + (CH_3CO)_2O \xrightarrow{273\text{-}283K}$? $\xrightarrow[\Delta]{H_3O^+}$  (NEET 2013)

30.  $\xrightarrow{Cl_2/h\nu}$? $\xrightarrow[373\ K]{H_2O}$? (NEET 2020)

31.  $\xrightarrow[B]{A}$  (NEET)

32. Above reaction is called -

33. RMgX + CdCl2 →

34. R'COCl + R2Cd →

35. $CH_3 - CH_2 - C \equiv N + C_6H_5MgBr \xrightarrow{ether} CH_3CH_2 - \overset{\overset{NMgBr}{\|}}{C} \underset{C_6H_5}{} \xrightarrow{H_3O^+}$

36. (C6H5CH2)2Cd + 2CH3COCl →

37.  $\xrightarrow[2.\ H_3O^+]{1.\ CrO_2Cl_2}$

PHYSICAL PROPERTIES

38. The boiling points of aldehydes and ketones are higher than hydrocarbons and ethers of comparable molecular masses. T/F

39. Compare the b.p. of alcohol, ether, ketone, aldehyde, hydrocarbons when they have almost the same molecular mass.

40. Methanal is a gas/liquid.

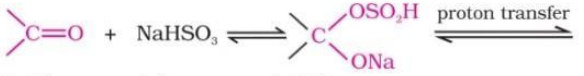
41. Ethanal is a gas/liquid.

42. Aldehyde from H-bond with water. T/F

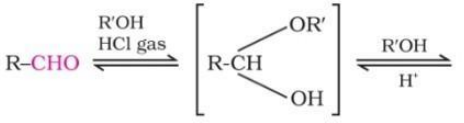
CHEMICAL REACTIONS

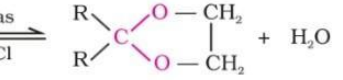
Nucleophilic addition & reduction

43. Ketones are generally more reactive than aldehydes in nucleophilic addition reactions. T/F

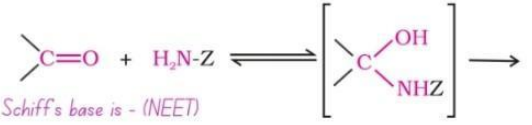
44. 

45. Acetals are gem-dialkoxy compounds. T/F

46. 

47. A + B 

48. What is the function of dry HCl in the above reaction ?

49. 

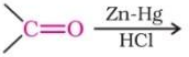
50. Schiff's base is - (NEET)

51. Name the reagent and product name of each species of compounds.

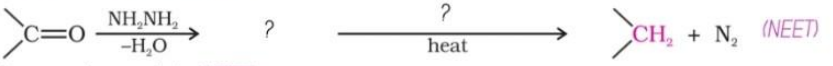
Z	Reagent name	Carbonyl derivative	Product name
-H		C=NH	
-R		C=NR	
—OH		C=N–OH	
—NH_2		C=N–NH_2	
—HN—		C=N-NH—	
—HN— (O_2N, NO_2)		C=N-NH— (O_2N, NO_2)	
—NH—C(=O)—NH_2		C=N-NH—C(=O)—NH_2	

52. 2,4-DNP test is for -

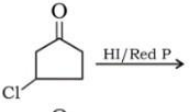
53. _____ colour solution is obtained if 2,4-DNP test is positive.

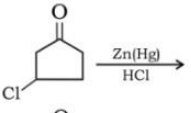
54. 

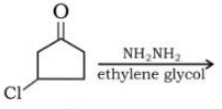
55. Above reaction is called - (NEET)

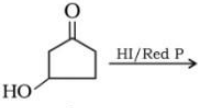
56. 

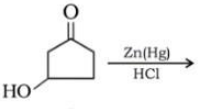
57. Above reaction is called - (NEET)

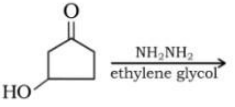
58. 

59. 

60. 

61. 

62. 

63. 

Oxidation

64. Tollens and Fehlings reagent oxidise aldehydes. T/F

65. What is Tollen's reagent ?

66. Tollen's test and fehling test are used to distinguish -

67. Tollen's test for fructose is -ve. T/F

68. If the tollens test is +ve, _____ is produced. (NEET)

69. Tollens and fehling tests occur in acidic/alkaline medium.

70. Write the Tollens test reaction.

71. Fehling test is +ve for - (2)

72. Fehling solution A is _____ and fehling solution B is _____.

73. Rochelle salt is called -

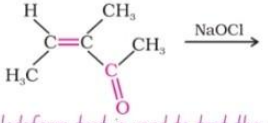
74. On heating an aldehyde with Fehling's reagent, _____ colour precipitate is obtained.

75. Write the reaction of the Fehling test.

76. Aromatic aldehyde also give fehling test. T/F

77. In benedict's test, instead of rochelle salt, _____ is used and all other things are same as fehling test.

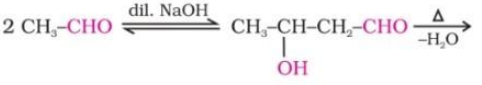
78. 

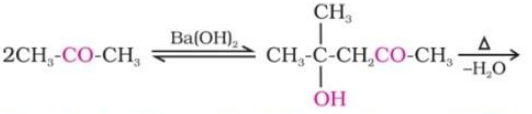
79. 

80. Iodoform test is used to test the presence of _____ and _____ group. (NEET)

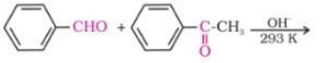
Aldol condensation & Cannizzaro

81. β-hydroxy ketones are called -

82. 

83. 

84. Reagents and conditions used in aldol condensation are - (NEET)

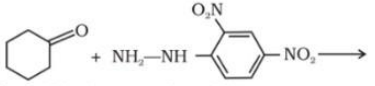
85. 

86. RDS (rate determining step) in cannizzaro is -

87. Reagents used in cannizaro are -

88. Benzaldehyde + Formaldehyde + conc. NaOH →

89. The small/big aldehyde unit in cannizaro is oxidised. T/F

90. 

91. Benzaldehyde are used in - (2)

92. Acetaldehyde is used primarily as a starting material in the manufacture of - (5)

CARBOXYLIC ACID

INTRODUCTION

93. Common name of CH3CH2COOH -

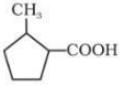
94. Oxalic acid iupac name is -

95. Malonic acid formula -

96. Adipic acid formula -

97. From ethanedioic acid to hexanedioic acid, tell the common name of each acid.

98. Phenylacetic acid structure -

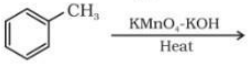
99. IUPAC name of - (i)  (ii) $Ph\,CH_2CH_2COOH$

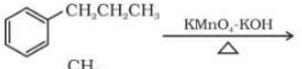
PREPARATION OF CARBOXYLIC ACIDS

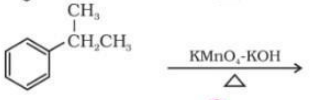
100. Primary alcohol are oxidised to carboxylic acid by - (3) (NEET)

101. Jones reagent is -

102. $RCH_2OH \xrightarrow[2.\ H_3O^+]{1.\ \text{alkaline } KMnO_4}$

103. 

104. 

105. 

106. $R\text{-}CN \xrightarrow[H_2O]{H^+ \text{ or } \bar{O}H} R\text{—}\overset{\overset{O}{\|}}{C}\text{—}NH_2 \xrightarrow[\Delta]{H^+ \text{ or } \bar{O}H}$

107. $CH_3CONH_2 \xrightarrow[\Delta]{H_3O^+}$

108. 

109. $R\text{-}Mg\text{-}X + O{=}C{=}O \xrightarrow{\text{Dry ether}} A \xrightarrow{H_3O^+} B$ Identify A & B. (NEET)

110. Benzoic anhydride on hydrolysis give -

111. 

112. RCCl3 + A → RCOOH. What is A ?

113. R-C=C-R' + A → RCOOH + R'COOH. What is A ?

114. CH2=CH2 + CO + H2O [H2PO4/573K-673K] →

115. The above reaction is called _____ and it follows the markovnikov/anti-markovnikov mechanism.

116. $R\text{-}\underset{\underset{COOH}{|}}{CH}\text{-}COOH \xrightarrow{\Delta}$

117. How to convert cyclohexene to hexane-1,6-dioic acid ?

118. Convert 2-Nitrobromobenzene to 3-Nitrobenzoic acid.

PHYSICAL PROPERTIES

119. Upto ___ carbons carboxylic acids exist as liquids.

120. Carboxylic acids have b.p. even higher than alcohols of comparable molecular masses. T/F

121. The reason of the above statement is - (NEET)

122. Carboxylic acids are soluble in water upto __ carbons.

CHEMICAL REACTIONS

123. Carboxylic acids are less acidic than phenols. T/F

124. Any substitution at ortho position will decrease the acidic strength of benzoic acid. T/F

125. Arrange the groups NO2, CN, CF3, Ph, I, Br, Cl, I in increasing acidity order when they are attached to carboxylic acids. (NEET)

126. Direct attachment of groups such as phenyl or vinyl to the carboxylic acid, increases the acidity of corresponding carboxylic acid. T/F

127. The reason for the increase in acidity is because of resonance. T/F

128. The reason for increase in acidity is -

129. $H_3C\text{—}\overset{\overset{O}{\|}}{C}\text{—}OH + HO\text{—}\overset{\overset{O}{\|}}{C}\text{—}CH_3 \xrightarrow[\text{or } P_2O_5,\Delta]{H^+,\ \Delta}$

130. Esterification is a kind of electrophilic/nucleophilic substitution.

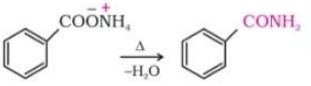
131. $RCOOH + A \rightarrow RCOCl + POCl_3 + HCl$. Identify A.

132. $RCOOH + PCl_5 \rightarrow$ (NEET)

133. $RCOOH + SOCl_2 \rightarrow$ (NEET)

134. Why is $SOCl_2$ prefered while forming acid chloride from carboxylic acid ?

135. $CH_3COOH + NH_3 \rightleftharpoons A \xrightarrow[-H_2O]{\Delta} B$ What are A & B ?

136. A + B  (NEET)

137. $NaBH_4$ does not reduce the carboxyl group. T/F

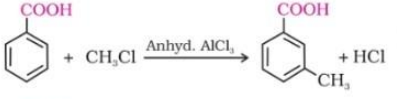
138. Carboxylic acids are reduced by - (2)

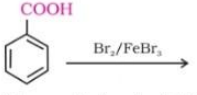
139. Diborane can easily reduce functional groups such as ester, halo,etc. T/F

140. $R\text{-}COONa \xrightarrow[\text{Heat}]{NaOH \ \& \ CaO}$

141. $R\text{-}CH_2\text{-}COOH \xrightarrow[(ii)]{(i)} R\text{-}\underset{\underset{X}{|}}{CH}\text{-}COOH$ (NEET)

142. The above reaction is called -

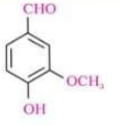
143.  T/F.

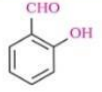
144. 

145. Adipic acid when heated form -

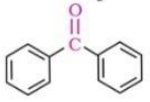
ANSWERS

• ALDEHYDES AND KETONES

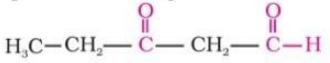
1. 

2. 

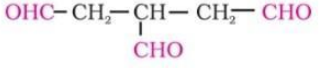
3. Cinnamaldehyde

4. 

5. Cyclohexanecarbaldehyde

6. 

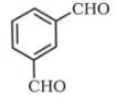
7. CHO-CH2-CH2-CH2-CHO

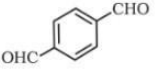
8. 

9. CH3-CH2-CH2-CH2-CHO

10. CH2=CH-CHO

11. Phthalaldehyde

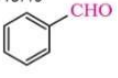
12. 

13. 

14. (CH3)2C=CHCOCH3

15. CH3CHO

16. HCHO

17. 

18. Rosenmund reduction

19. R-CH=CH2 + PdCl2 [Air/H2O/CuCl2] → R-CO-CH3 + Pd + HCl

20. RCH=NH

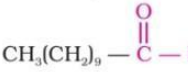
21. Stephen reaction

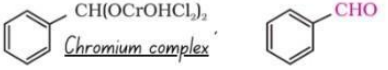
22. Diisobutylaluminium hydride

23. H- given by DIBAL-H have high electron density which cause repulsion with double bond

24. RCHO

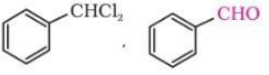
25. 1. AlH(i-Bu)2, 2. H2O

26. 

27. 

28. Etard reaction

29. 

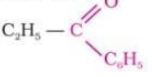
30. 

31. A - CO, HCl B - anhyd. AlCl3/CuCl

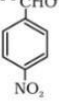
32. Gattermann-Koch reaction

33. R2Cd + MgXCl

34. R'-CO-R + CdCl2

35. 

36. C6H5-CH2-CO-CH3

37. 

38. T

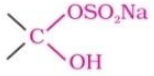
39. Alcohol > Ketone > Aldehyde > Ether >Hydrocarbon

40. Gas

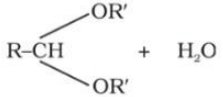
41. Volatile liquid

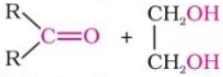
42. T

43. F

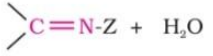
44. 

45. T

46. 

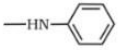
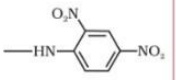
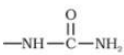
47. 

48. Protonates the oxygen of the carbonyl compounds and therefore increase the electrophilicity of the carbonyl carbon

49. 

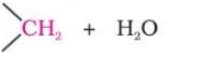
50. Substituted imine

51.

Z	Reagent name	Carbonyl derivative	Product name
-H	Ammonia		Imine
-R	Amine		Substituted imine (Schiff's base)
—OH	Hydroxylamine		Oxime
—NH_2	Hydrazine		Hydrazone
	Phenylhydrazine		Phenylhydrazone
	2,4-Dinitrophenyl-hydrazine		2,4 Dinitrophenyl-hydrazone
	Semicarbazide		Semicarbazone

52. Carbonyl group

53. Red orange colour

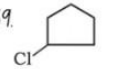
54. 

55. Clemmensen reduction

56.  , KOH/ethylene glycol + heat

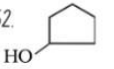
57. Wolff-Kishner reduction

58. 

59. 

60. 

61. 

62. 

63. 

64. T

65. Ammoniacal silver nitrate solution

66. Aldehydes from ketones, all aldehydes given +ve tollens and fehling test

67. F, tollen's test is +ve for fructose even when it is a ketone because α-hydroxy ketone get oxidised by tollens test, the hydroxyl group get oxidised

68. Bright silver mirror

69. Alkaline

70. $RCHO + 2[Ag(NH_3)_2]^+ + 3OH^- \rightarrow RCOO^- + Ag + H_2O + 4NH_3$

71. Aliphatic aldehyde and β-hydroxy ketone

72. A - Aqueous copper sulphate, B - Rochelle salt

73. Alkaline sodium potassium tartrate

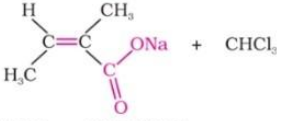
74. Reddish brown

75. R-CHO + Cu2+ + OH- → RCOO- + Cu2O + H2O

76. F

77. Sodium potassium citrate

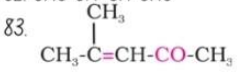
78. 

79. 

80. CH3CO- and CH3CH(OH)-

81. Ketol

82. CH3-CH=CH-CHO

83. 

84. dil.NaOH or any base in the 1st reaction, dehydration by heating in the 2nd reaction

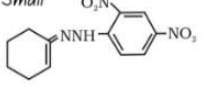
85. 

86. Hydride shift

87. Conc. NaOH/KOH

88. Benzyl alcohol + Formic acid

89. Small

90. 

91. Perfumery and dye industry

92. Acetic acid, ethyl acetate, vinyl acetate, polymers and drugs

• CARBOXYLIC ACID

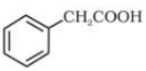
93. Propionic acid

94. Ethanedioic acid

95. HOOC-CH2-COOH

96. HOOC-(CH2)4-COOH

97. Oxalic acid, malonic acid, succinic acid, glutaric acid, adipic acid [Mnemonic - OM Shanti Gao]

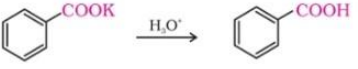
98. 

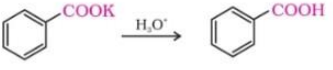
99. (i) 2-Methylcyclopentanecarboxylic acid
(ii) 3-Phenylpropanoic acid

100. KMnO4, K2Cr2O7 and Jones reagent

101. CrO3 in acidic media

102. RCOOH

103. 

104. 

105. gives nothing as tertiary group is not affected.

106. RCOOH

107. CH3COOH + NH3

108. 

109. R-COO-MgX+, RCOOH

110. 2 C6H5COOH

111. 

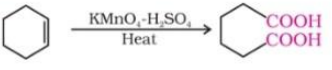
112. Aq.KOH/H2O

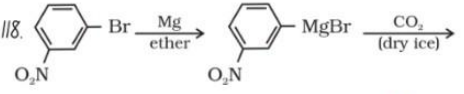
113. Hot conc. KMnO4/H+

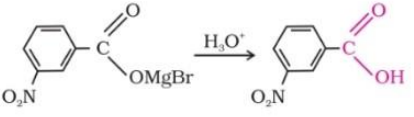
114. CH3-CH2-COOH

115. Koch reaction, markovnikov

116. R-CH2-COOH + CO2

117. 

118. 



119. 9

120. T

121. This is due to more extensive association of carboxylic acid molecules through intermolecular H bonding

122. 4

123. F

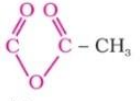
124. F

125. Ph < I < Br < Cl < F < CN < NO2 < CF3

126. T

127. F

128. High electronegativity of sp2 hybridised C to which -COOH is attached

129. 

130. Electrophilic

131. PCl3

132. RCOCl

133. RCOCl + SO2 + HCl

134. Because the other products are gaseous and escape the reaction mixture

135. A -CH3COO-NH4+, B -CH3CONH2

136. 

137. T

138. LiAlH4 or B2H6

139. F

140. R-H + Na2CO3

141. (i) - X2/Red phosphorus, (ii) - H2O

142. Hell-Volhard-Zelinsky reaction

143. F. No reaction. They do not reaction because the catalytic aluminium chloride gets bounded to carboxylic acid.

144. 

145. Cyclopentanone  , (Blanc's rule)