XII UNIT 12

Aldehydes, Ketones and Ethers

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CHEMISTRY MANTRA

105 Dilbagh Nagar Extension Jalandhar

Unit 12
Aldehydes, Ketones and Ethers

Q.1 Although phenoxide ion has more no. of resonating structures than carboxylate ion, even though carboxylic acid is a stronger acid why?

Ans:- The phenoxide ion has non-equivalent resonance structures in which –ve charge is
at less electronegative C atom and +ve charge as at more electronegative O-atom.
In carboxylate ion –ve charge is delocalized on two electronegative O-atoms hence
resonance is more effective and a stronger acid.

Q.2 Why Carboxylic acid have higher boiling point than alcohols as alcohol forms strongest inter molecular hydrogen bonding?

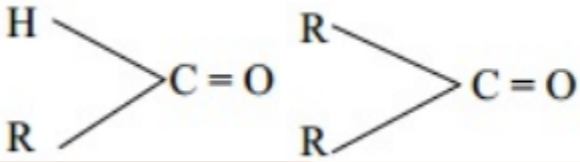
Ans. As Carboxylic acid forms a dimer due to which their surface area increases and
forms strong intermolecular H-bonding. It has more boiling point than alcohols.

Q.3 Why does solubility decrease with increasing molecular mass in carboxylic acid?

Ans. Because of increase in alkyl chain length which is hydrophobic in nature. Hence solubility decreases.

Q.4 Why aldehydes are more reactive than ketones when undergo nucleophilic addition reaction?

Ans. a. + I effect:- The alkyl group in Ketones due to their e-releasing character decrease the +ve charge on C-Atom and thus reduce its reactivity.
b. Steric hinderance:- Due to steric hinderance in ketones they are less reactive.



Q.5 Why PCC cannot oxidise methanol to methanoic acid and while KMNO4 can?

Ans. This is because PCC is a mild oxidising agent and can oxide methanol to methanal
only. While $KMNO_4$ being strong oxidising agent oxidises it to methanoic acid.

Q.6 During preparation of esters from a carboxylic acid and an alcohol in the presence of acid catalyst water or ester formed should be removed as soon as it is formed.

Ans. The formation of esters from a carboxylic acid and an alcohol in the presence of acid catelyst in a reversible reaction.

$R - COOH + R'OH \underset{}{\overset{H_2SO_4}{\rightleftharpoons}} H_2SO_4\ R - COOR' + H_2O$

To shift the equilibrium in forward direction, the water or ester formed should be removed as fast as it is formed.

Q.7 Why HCOOH does not give HVZ reaction while CH_3COOH does?

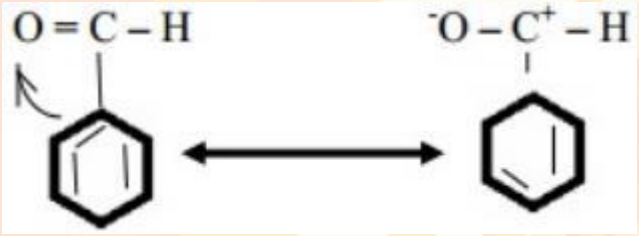
Ans. CH_3COOH contains α-hydrogens and hence give HVZ reaction but HCOOH does not
contain α-hydrogen and hence does not give HVZ reaction.

Q.8 Suggest a reason for the large difference in the boiling point of butanol and butanal although they have same solubility in water.

Ans. Because Butanol has strong intermolacular H-bonding while butanal has weak dipole-dipole interaction.
However both of them form H-bonds with water and hence are soluble.

Q.9 Would you expect benzaldehyde to be more reactive or less reactive in nucleophilic addition reaction than propanol. Explain.

Ans. C-atom of Carbonyl group of benzaldehyde is less electrophilic than Catom of Carbonyl group in propanol. Polarity of Carbonyl group is in benzaldehyde reduced due to resonance making it less reactive in nucleophillic addition reactions.



Q.10 Why does methanal not give aldol condensation while ethanol gives?

Ans. This is because only those compounds which have α-hydrogen atoms can undergo aldol reaction ethanol possess α-hydrogen and undergoes aldol condensation. Methanal has no alpha hydrogen atoms hence does not undergo aldol condensation.

Q.11 Why does methanal undergo Cannizaro's reaction?

Ans. Methanal undergo Cannizaro's reaction because it does not possesses α-hydrogen atom.

Q.12 Which acid is stronger and why?

F_3C-C_6H_4COOH and $CH_3C_6H_4COOH$

Ans. CH^-_3 has strong (-I) effect Whereas, CF^-_3 has strong (+I)effect
Due to greater stability of $F_3CC_6H_4COO^-$ ion over CH_3-$C_6H_4COO^-$ ion.
CF_3 C_6H_4COOH is much stronger acids than CH_3-C_6H_4COOH.

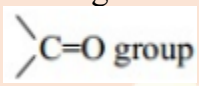
Q.13 Explain why O-hydroxy benzaldehyde is a liquid at room temperature while p hydroxy benzaldehyde is a high melting solid.

Ans. Due to intramolecular H-bonding in O-hydroxy benzaldehyde exists as discrete molecule whereas due to intermolecular H-bonding p-hydroxy benzaldehyde exist as associated molecules. To break this intermolecular H-bonds a large amount of energy is needed. Consequently P-isomer has a much higher m.p. and b.p. than that of O-isomer. As a result O-hydroxy benzaldehyde is liquid.

Q.14 Why is the boiling point of an acid anhydride higher than the acid from which it is derived?

Ans. Acid anhydrides are bigger in size than corresponding acids. They have more surface area, more Van der Waals force of attraction hence have higher boiling point.

Q.15 Why do Carboxylic acids not give the characteristic reactions of a carbonyl group?

Ans. Due to resonance, It doesn't give the characteristics reactions of carbonyl group. It does not have free 

Q.16 Cyclohexanone forms cyanohydrin in good yield but 2,2,6 trimethyle cyclo-hexanone does not. Why?

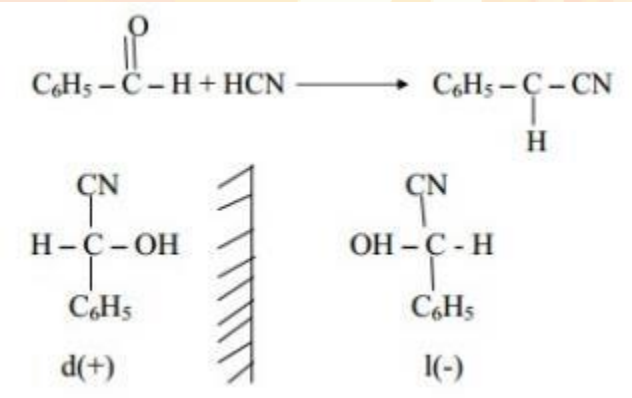
Ans. In 2,2,6 trimethyl cyclohexaunone there is strearic hinderance of 3 methyl groups, It
does not form cynohydrin in good yield.

Q.17 Why is carboxyl group in benzoic acid meta directing?

Ans. In benzoic acid the Carboxyl group is meta directing because it is electron withdrawing. There is +ve charge on ortho acid para positions. Electrophillic substitution takes place at meta-position.

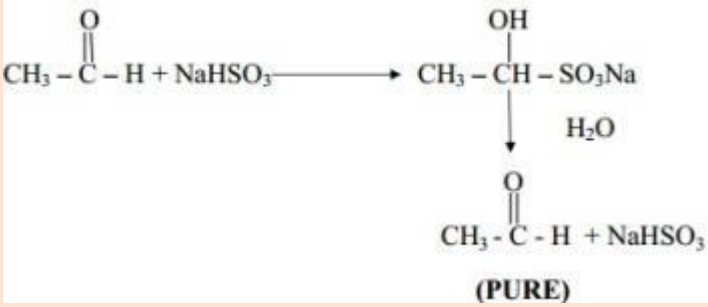
Q.18 Treatment of Benzaldehyde with HCN gives a mixture of two isomers which cannot be separated even by careful fractional distillation. Explain why?

Ans. It is because we get two optical isomers which have same physical Properties cannot be Separated by Fractional distillation.



Q.19 Sodium Bisulphite is used for the purification of aldehydes and Ketones. Explain.

Ans. Aldehydes and Ketones form addition compounds with $NaHSO_3$ whereas impurities do not. On hydrolysis we get pure aldehydes and Ketones back.



Q.20 Why pH of reaction should be carefully controlled while preparing ammonia derivatives of carbonyl compound?

Ans. In strongly acidic medium ammonia derivatives being basic will react with acids and will not react with carbonyl compound. In basic medium, OH will attack carbonyl group.pH of a reaction should be carefully controlled.