

ANSWERS TO THE SHORT QUESTIONS

GENERAL FEATURES OF ALDEHYDES AND KETONES

Q.1 How aldehydes and ketones occur in nature?

Ans: (a) Aldehydic group is present in most of the sugars.

(b) Aldehydes are the principal constituents of a number of essential oils

(c) The essential oils are used as fragrances and flavours.

Q.2 What are those factors which make aldehydes more reactive than ketones? (Sargodha 2010)

Ans: The presence of hydrogen atom with the carbonyl group in aldehydes makes less steric hindrance as compared to ketone.

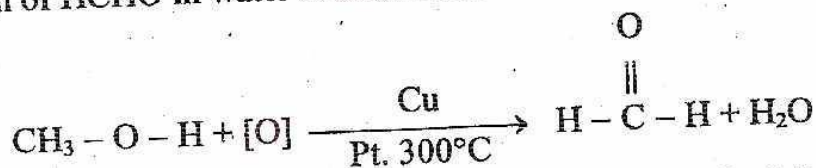
In ketones, the alkyl groups are electron-donating and they decrease the electrophilic character of carbonyl carbon atom.

PREPARATION OF ALDEHYDES

Q.3 How formalin is prepared on the commercial scale from methyl alcohol?

(Lahore 2011, Multan 2011, F. Abad 2012, Lahore 2013, D.G. Khan

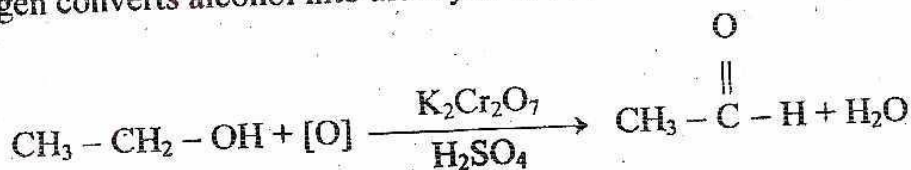
Ans: Mixture of methyl alcohol vapours and air is passed over platinized asbestos at 300°C. Sometimes, copper and silver catalysts are also used. The 40% solution of HCHO in water is called formalin:



Q.4 How acetaldehyde is prepared from ethyl alcohol in the laboratory?

(Multan 2011, F. Abad 2012, Multan

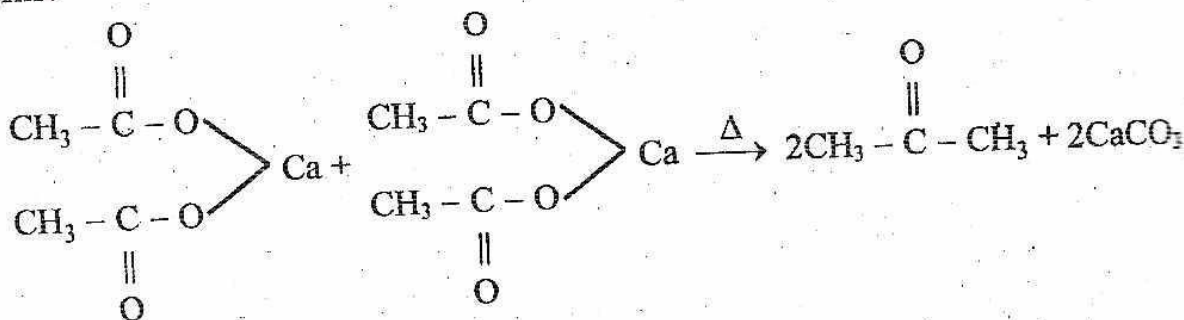
Ans: The oxidizing agents for ethyl alcohol is acidified $\text{K}_2\text{Cr}_2\text{O}_7$. The atomic oxygen converts alcohol into aldehyde at 500°C:



Q.5 Which product is obtained by heating calcium acetate?

(F. Abad 2012, Guj.

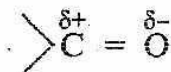
Ans:



PROPERTIES OF ALDEHYDES AND KETONES

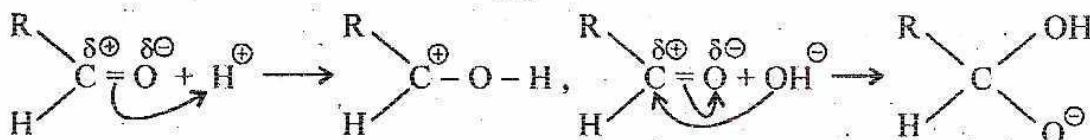
Q.6 What type of polarity is present in carbonyl group?

Ans: Carbonyl group is polar due to the difference of electronegativity between carbon and oxygen. so carbon becomes electrophilic center and the oxygen as nucleophilic center.



Q.7 How acids and bases acting as catalysts increase the reactivity of aldehydes and ketones? (Faisalabad 2010, Lahore 2013)

Ans: The H^+ ion of the acid attacks the nucleophilic oxygen of the carbonyl group and makes the carbonyl carbon atom as strong electrophilic center. It increases the reacting power of the carbonyl group. Similarly, bases increase the nucleophilic character of oxygen.



ADDITION REACTIONS

Q.8 Addition of HCN on aldehydes and ketones is a base catalyzed reaction. How? (Multan 2008, Sargodha 2009, 2010, Rwp. 2011)

Ans: Base dissociates the weak acid HCN to give CN^- . This CN^- attacks the carbonyl carbon atom of aldehydes and ketones to give addition compounds.

Q.9 HCN is not directly used in aldehydes and ketones. Give reasons.

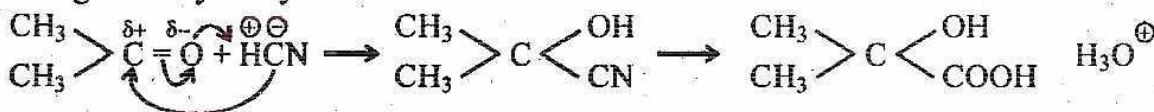
(D.G. Khan 2013)

Ans: HCN is a poisonous gas and it is difficult to handle it. NaCN and HCl are directly added to aldehydes and ketones which generate HCN in the vessel and is immediately consumed for the addition purposes.

Q.10 How α -hydroxy acids are produced from aldehydes and ketones?

(Multan 2008, Guj. 2010, Rwp. 2010, Bahawalpur 2011, Lahore 2012, Lahore 2013, D.G. Khan 2013)

Ans: HCN is added at the aldehydes and ketones. α -hydroxy cyanides are produced. These hydroxy cyanides are hydrolyzed with an acid or a base to give α -hydroxy acids.



Q.11 The addition product of an aldehyde and a ketone with NaHSO_3 is very useful reaction. Justify it; (Guj. 2012)

Ans: Bisulphite addition compounds of aldehydes and ketones are white ppts. So these ppts. are separated, treated with acids and are regenerated. In this way, separation can be done. Moreover, we can distinguish between methyl ketones and other ketones by this reaction.

Q.12 Why NaHSO_3 does not give the reaction with 2-pentanone?

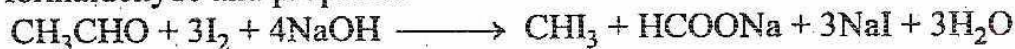
Ans: 2-Pentanone is such a ketone in which both the alkyl groups are big sized. Due to steric hinderance, NaHSO_3 feels difficulty for adding at such a ketone.

HALOFORM REACTION

Q.18 How iodoform is prepared from ethanol and acetaldehyde?

(Lahore 2010, Multan 2011, Guj. 2012, D.G. Khan 2013)

Ans: Acetaldehyde has one methyl group attached with the carbonyl group which is converted into iodoform. No such methyl group is present in formaldehyde and propanal.



Actually ethanol is first oxidized to CH_3CHO with I_2 and NaOH .

Q.19 Only methyl ketones are able to give haloform reaction, but other ketones do not. Give reasons: (Faisalabad 2011)

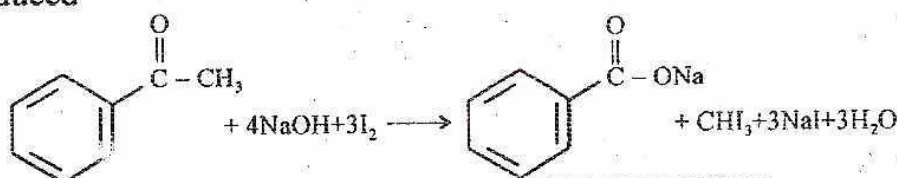
Ans: The $-\text{CH}_3$ group attached with the carbonyl group is converted to CHX_3 . Other methyl groups cannot be converted into such compounds.

Q.20 With the haloform reaction we can decrease the number of carbon atoms in aldehydes and ketones. Give reasons:

Ans: One of the carbon atoms of aldehydes and ketones which is present in the form of CH_3 -group is detached from the molecule and CHX_3 is produced. The rest of the portion of the molecule is converted to carboxylic acids with one carbon atom less than the original aldehyde or ketone.

Q.21 How acetophenone can be converted into sodium salts of benzoic acid?

Ans: When acetophenone undergoes haloform reaction, sodium benzoate is produced



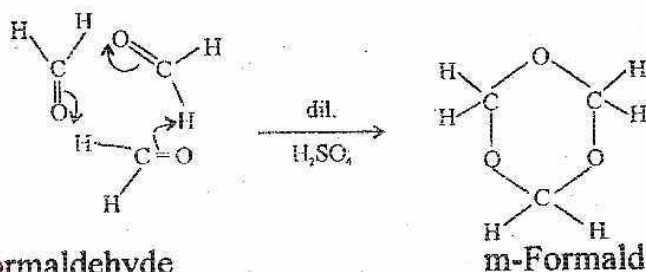
POLYMERIZATION REACTIONS

Q.22 Polymerization of formaldehyde gives six membered cyclic compounds.

Justify it.

(Multan 2012, Guj. 2013)

Ans:

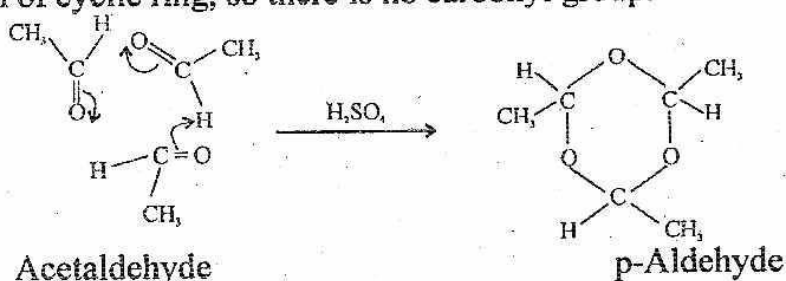


Formaldehyde

m-Formaldehyde

Q.23 Justify that the carbonyl group of acetaldehyde is no more there is its polymer i.e. paraldehyde. (Multan 2012)

Ans: Actually, the double bond of the carbonyl functionality helps in the formation of cyclic ring, so there is no carbonyl group.



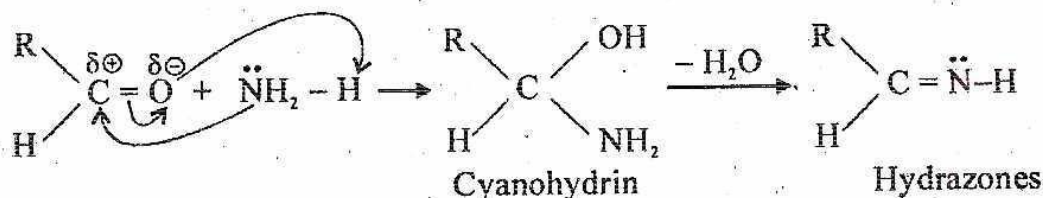
Acetaldehyde

p-Aldehyde

REACTIONS WITH NH₃ AND ITS DERIVATIVES

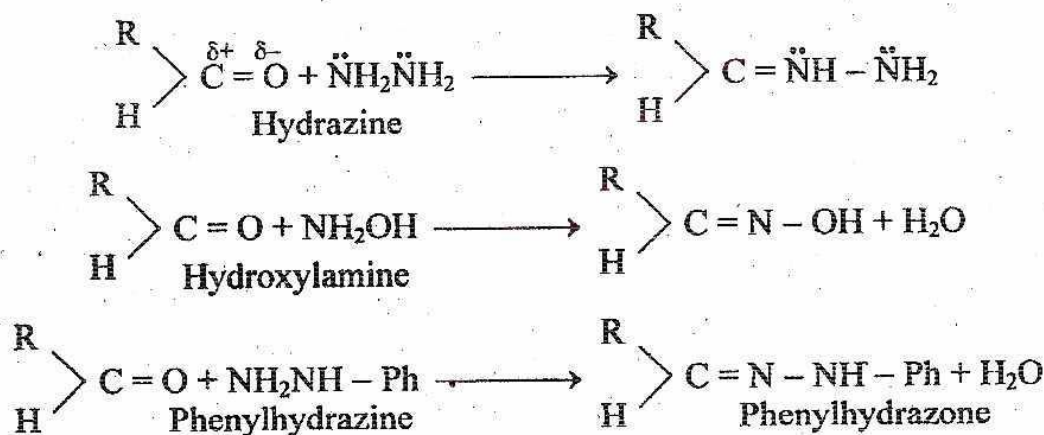
Q.24 NH₃ reacts with aldehydes and ketones to give cyanohydrins and then hydrazones. Justify it:

Ans:



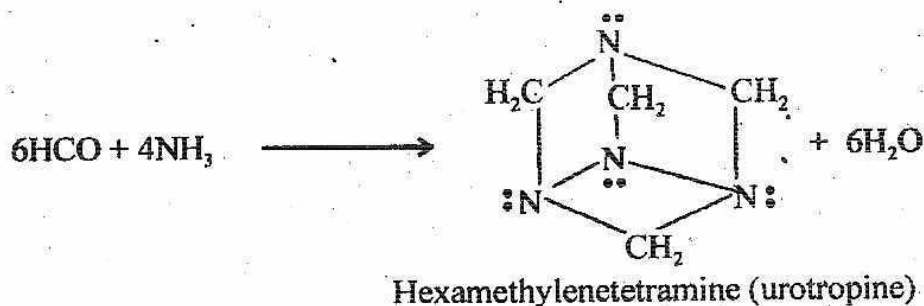
Q.25 The reactions of hydroxylamine, hydrazine and phenyl hydrazine with aldehydes and ketones are just like the reactions of NH₃ with aldehyde and ketone?
(Guj. 2008, Mirpur 2011, Lahore 2013)

Ans:



Q.26 NH₃ reacts with formaldehyde in different manner from other aldehydes and ketones. Justify it.

Ans: NH₃ reacts with formaldehyde to give hexamethylenetetramine.



Q.27 2, 4-Dinitrophenylhydrazine can be used to have a distinction between aldehydes and ketones from other organic compounds:

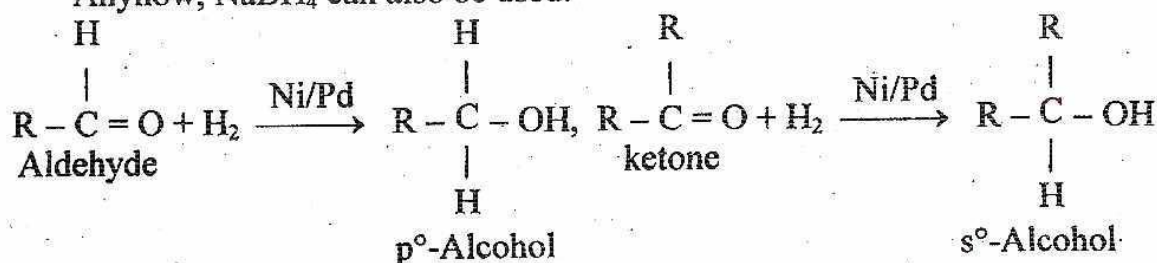
Ans: 2, 4-Dinitrophenyl hydrazine reacts with aldehydes and ketones to give deep yellow colour ppt., but other compounds can not do so.

REDUCTION REACTIONS

Q.28 How the reduction process of aldehydes and ketones give alcohols?

(Lahore 2013)

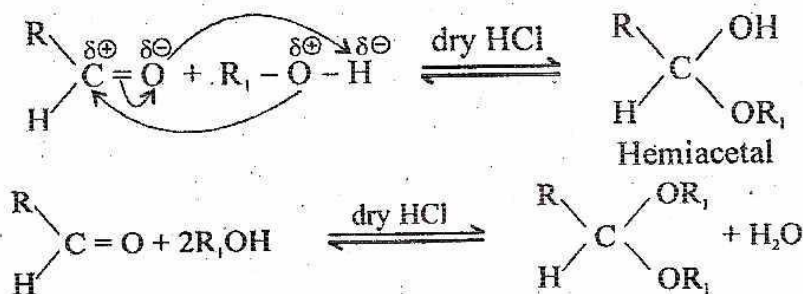
Ans: When aldehydes and ketones are reduced with hydrogen in the presence of a catalyst, primary and secondary alcohols are produced respectively. Anyhow, NaBH_4 can also be used.



Q.29 How aldehydes react with alcohols to give hemiacetals and acetals.

(F. Abad 2013, D.G. Khan 2013)

Ans:



OXIDATION OF ALDEHYDES AND KETONES

Q.30 Which are those weak oxidizing agents which can oxidize aldehydes but not the ketones?

(Rawalpindi 2006, Sargodha 2008, Faisalabad 2010, Lahore 2013)

Ans: Tollen's reagent, Fehling's solution and Benedict's solution are weak oxidizing agents. They can oxidize aldehydes into corresponding carboxylic acids and ppts. are produced. Ketones do not give such reactions.

Q.31 Tollen's test is also called silver mirror test. Justify it.

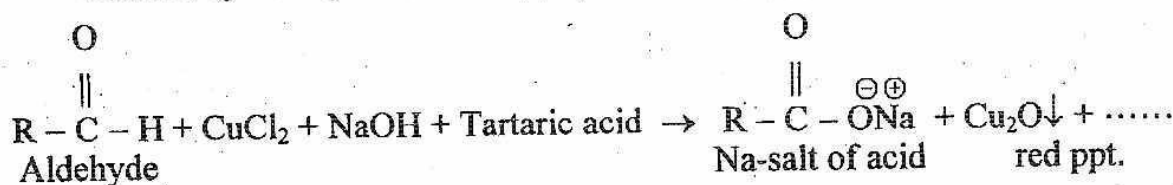
(Raw. 2006, Sargodha 2008, Bahawalpur 2011, Lahore 2013, Guj. 2013, F. Abad 2013, Multan 2013, D.G. Khan 2013)

Ans: Tollen's reagent is the ammonical solution of AgNO_3 and it is weak oxidizing agent. It is itself reduced into silver metal by aldehydes and silver metal is deposited in the form of mirror on the inner side of test tube.

Q.32 Fehling's solution reacts with aldehydes to give red ppt. Justify it:

(Sargodha 2008, Guj. 2008, Bahawalpur 2011, Lahore 2012, F. Abad 2012, Lahore 2013, F. Abad 2013)

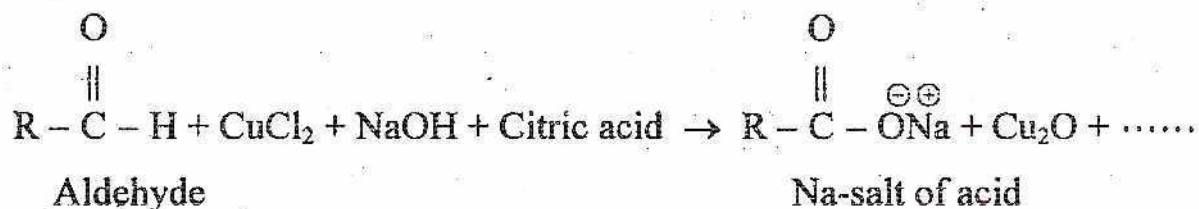
Ans: Fehling's solution is a mixture of CuCl_2 , NaOH and tartaric acid. It is reduced by aldehydes and red ppt. of Cu_2O is produced



Q.33 Benedict's solution reacts with aldehydes to give red ppt. Justify it:

(Sargodha 2008, D.G. Khan 2013)

Ans: Benedict's solution is consisted of CuCl_2 , NaOH and citric acid. It is reduced into Cu_2O as red ppt. by aldehydes.



USES

Q.34 Give the uses of formaldehyde:

(Multan 2012, Guj. 2013)

Ans: Formaldehyde is used for the manufacture of Bakelite and dyes. It is used to prepare formalin, which is used as the antiseptic, disinfectant, germicide, fungicide and preservation of biological specimens. It is also used in the silvering of mirrors and many medicines.

Q.35 Give the uses of acetaldehyde.

(D.G. Khan 2013)

Ans: Acetaldehyde is used for the production of acetic acid, acetic anhydride, n-butanol, ethanol, vinyl acetate, paraldehyde and ethyl acetate. Moreover, we can prepare chloralhydrate and phenolic resins.

COMPARISONS

Q.36 How do you compare formaldehyde and acetaldehyde? (Lahore 2013)

Ans: Formaldehyde gives Cannizzaro's reaction, but acetaldehyde gives aldol condensation. Formaldehyde gives bakelite, but acetaldehyde can not do so.

Formaldehyde does not give haloform reaction, but acetaldehyde does.

Q.37 How do you compare aldehydes and ketones?

(D.G. Khan 2011, Sargodha 2011)

Ans: Aldehydes give silver mirror test, give red ppt. with Fehling's solution, and red ppt. with Benedict's solution, but ketones can not give these reactions. Moreover, aldehydes can polymerize but ketones cannot.