12 Aldehydes, Ketones and Carboxylic Acids

SECTION-I: ALDEHYDES AND KETONES

Section-I: Halogen Derivatives of Alkanes

INTRODUCTION

Aldehydes and ketones are carbonyl compounds, they contain carbonyl (>C=O) group. General formula of aldehydes and ketones is $C_nH_{2n}O$.

Definitions:

Aldehydes: These are first oxidative products of primary alcohols, in which carbonyl carbon atom is attached to, at least one H- atom. These are presented asR-CHO.

e.g. H–CHO formaldehyde; CH_3–CHO acetaldehyde

Ketones: These are first oxidative products of secondary alcohols, in which carbonyl carbon atom is attached to two same or different alkyl groups. These are represented as, R–CO–R.

e.g. CH_3–CO–CH_3 acetone; CH_3–CO–C_2H_5 ethyl methyl ketone

ISOMERISM IN ALIPHATIC ALDEHYDES AND KETONES :

Aldehydes : They shows chain tautomerism, Optical isomerism themselves and functional isomerism with ketones.

Ketones: They shows chain, tautomerism ,optical isomerism, metamerism themselves and functional isomerism with aldehydes.

(i) C_3H_6O

(a) CH_3CH_2CHO propanal

(b) CH_3COCH_3 propanone

(ii) C_4H_8O

(a) $CH_3CH_2CH_2CHO$ butanal

(b) $CH_3CH(CH_3)CHO$ 2-methylpropanal

(c) $CH_3COCH_2CH_3$ 2-butanone

(iii) $C_5H_{10}O$

(a) $CH_3CH_2CH_2CH_2CHO$ pentanal

(b) $CH_3CH_2CH(CH_3)CHO$ 2-methyl butanal

(c) $CH_3CH(CH_3)CH_2CHO$ 3-methyl butanal

(d) $(CH_3)_3CCHO$ 2,2-dimethyl propanal

(e) $CH_3CH_2COCH_2CH_3$ 3-pentanone

(f) $CH_3COCH_2CH_2CH_3$ 2-pentanone

(g) $CH_3COCH(CH_3)_2$ 3-methyl 2-butanone

Metamerism :

Metamerism is present in same class of compounds. It is shown by the compounds which have different alkyl groups(nature or type) attached to either side of polyvalent functional group.

e.g. pentan-2-one and pentan-3-one are metamers, not position isomers.

$CH_3CH_2COCH_2CH_3$ diethyl ketone

$CH_3COCH_2CH_2CH_3$ methyl, n-propyl ketone

pentan-2-one and 3-methyl butan-2-one are metamers not chain isomers

$CH_3COCH_2CH_2CH_3$ 2 pentanone

$CH_3COCH(CH_3)_2$ 3-methyl, 2-butanone

Note: Metamers are either chain or position isomers. If metamerism is mentioned then never write chain or position isomerism.

Tautomerism:

Definition: It is one type of functional isomerism, in which a single compound exists in two or more readily interconvertible structures that differ in the relative position hydrogen.

Only α-H atom involved in tautomerism

e.g. Acetone and prop-l-en-2-ol are tautomers

STRUCTURE OF CARBONYL GROUP

1. Carbonyl group (> C = O) consist of one sigma and one π bond.
2. In carbonyl group carbonyl carbon atom is in sp^2 hybridised state.
3. The sigma bond is formed by sp^2 hybrid orbital of carbon and p-orbital of oxygen i.e. sp^2-p overlappling.
4. The π bond is formed by sideways overlapping of unhybridisedp-orbital of carbon and p-orbital of oxygen i.e., p-p overlapping.
5. Carbonyl carbon atom is joined to three atoms of sigma bond making a bond angle 120^0, therefore, carbonyl group has trigonal planer structure.
6. In carbonyl group, oxygen is more electronegative than carbon hence oxygen carries partial negative charge (nucleophilic or Lewis base centre) and carbon carries partial positive charge (electrophilic or Lewis acid centre).
7. The high polarity of carbonyl group is explained on tbe basis of resonance structure.

$$\underset{\text{neutral structure}}{>C=O} \longleftrightarrow \underset{\text{dipolar structure}}{>\overset{+}{C}-\overset{-}{O}}$$

PREPARATION OF ALDEHYDES AND KETONES

1. **By oxidation of primary and secondary alcohols by using pyridinium chloro chromate (PCC) or pyridinium dichromate (PDC):**

   It oxidises only primary alcohol to aldehyde and secondary alcohol to ketones. PCC is the mixture pyridine, CrO and HC1 in 1:1:1 ratio. This reagent does not attack >C=C< bond. It is also known as **Collin's reagent.**

   e.g. $CH_3-OH+[O] \xrightarrow{PCC} H-CHO+H_2O$

2. **By dehydrogenaion of primary and secondary alcohols by using Cu or Fe or Ag metals at 573 K.**

   (a) Vapours of primary alcohols are passed over Cu or Fe metal at 573 K undergo dehydro-genation gives aldehydes. These are α–α elimination reactions.

   $$-CH_2CH \xrightarrow{Cu/573\ K} -CHO+H_2$$

   (b) Vapours of secondary alcohols are passed over Cu or Fe metal at 573 K undergo dehydrogenation gives ketones.

   $$>CHOH \xrightarrow{Cu/573\ K} >C=O+H_2$$

   Note: Tertiary alcohols are heated with copper metal at 573 K undergoes dehydration to give alkenes and water.

3. **From hydrocarbon**

   (a) **Ozonolysis of alkene :**

   $$CH_2=CH_2+O_2 \longrightarrow \underset{\text{ethylene ozonide}}{CH_2-O-CH_2 \text{ (O–O)}}$$

   $$\underset{\text{ethylene ozonide}}{CH_2-O-CH_2 \text{ (O–O)}} + H_2O \xrightarrow{Zn} Zn(OH)_2 + Zn(OH)_2 + 2H-CHO$$

   (b) Hydration of alkyne

   $$CH\equiv CH+H_2O \xrightarrow[10\ \%\ HgSO_4]{40\ \%\ H_2SO_4}$$

   $$\underset{\text{Vinyl alcohol}}{CH_2=CHOH} \xrightarrow{\text{rearrangement}} \underset{\text{acetaldehyde}}{CH_3-CHO}$$

4. **From dry distillation (pyrolysis or decarboxylation) of calcium salt of acids**

   (a) **Aldehydes:**

   $$\underset{\text{cal. formate}}{(H-COO)_2\ Ca} \xrightarrow[\text{distilled}]{\text{dry}} \underset{\text{formaldeyde}}{H-CHO} + CaCO_3$$

   (b) Ketones :

   e.g.$(C_2H_5–COO)_2Ca+(CH_3–COO)_2$ Ca

   cal.propionate Cal.acetate

   $$\xrightarrow{\text{dry distilled}} \underset{\text{ethyl methyl ketone}}{2C_2H_5–CO–CH_3} + 2CaCO_3$$

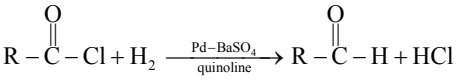
5. **From alkaline hydrolysis of geminal dihalide:** The geminal dihalides are boiled with aqueous KOH or NaOH. It produces aldehydes and ketones.

   $$\underset{\text{geminal dihalide}}{-\overset{|}{\underset{|}{C}}-X} + 2\ KOH \xrightarrow{\Delta} \underset{\text{unstable}}{-\overset{|}{\underset{|}{C}}-OH} + 2KX$$

   $$-\overset{|}{\underset{|}{C}}-OH \longrightarrow >C=O+H_2O$$

PREPARATION OF ONLY ALDEHYDES :

1. **Rosenmund reduction (Reduction of acyl chloride):** Acid chloride is reduced by Lindlar catalyst to give aldehyde. Function of $BaSO_4$ is to poison the catalyst at aldehyde stage.



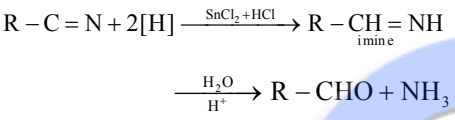
e.g. $CH_3-COCl + H_2 \xrightarrow[\text{quinoline}]{Pd-BaSO_4}$

acetyl chloride

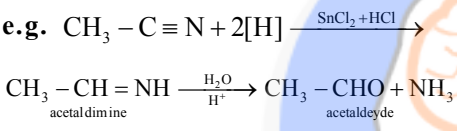
$CH_3COH + HCl$

acetaldehyde

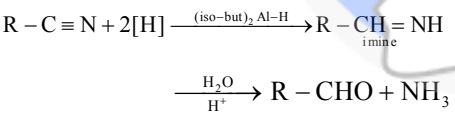
2. **Stephen's reduction (Reduction of cyanide by $SnCl_2$ + HCl)**



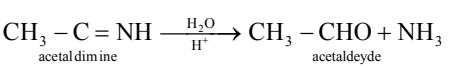
e.g. $CH_3-C\equiv N + 2[H] \xrightarrow{SnCl_2+HCl}$



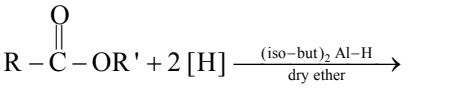
3. **Reduction of cyanide by di-isobutyl aluminium hydride $(iso\text{-}but)_2Al–H$ or $E(CH_3)_2CHCH_2]_2$ Al–H Di-iso-but-Al–H**



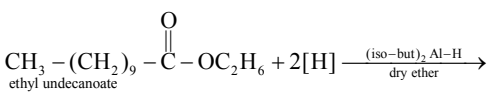
e.g. $CH_3-C\equiv N + 2[H] \xrightarrow{(iso-but)_2\,Al-H}$

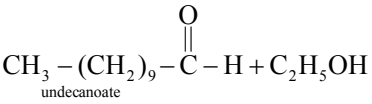


4. **Reduction of ester by $(Iso\text{-}but)_2$ Al–H**



e.g.





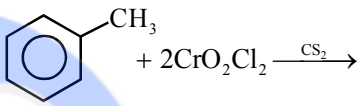
5. **From hydrocarbon :**

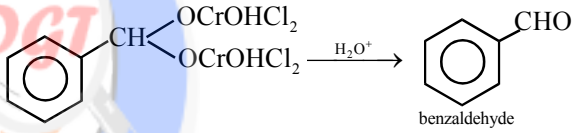
Aromatic aldehydes and its derivatives are prepared from aromatic hydrocarban by following methods.

Strong oxidising agent oxidies hydrocarbon into acids. It is possible to stop the oxidation at aldehyde stage using suitable reagent, that convert methyl group into intermediate which is difficult to oxidised further.

(i) Etard reaction (oxidation of toulene by chromyl chloride (CrO_2Cl_2)

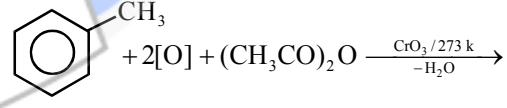
When toulene is oxidised by CrO_2Cl_2 first give chrominum complex which on acid hydrolysis gives benzaldehyde

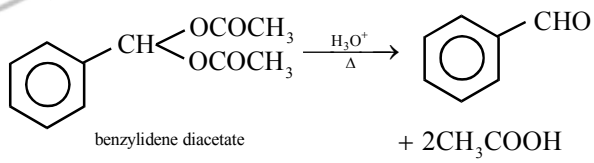




benzaldehyde

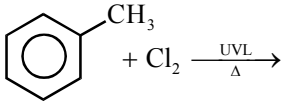
(ii) Oxidation of toluene by CrO_3 (chromium oxide) in acetic anhydride

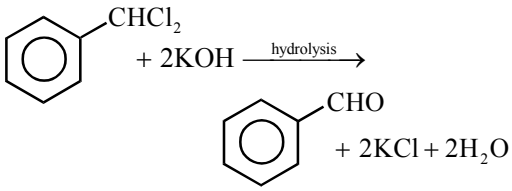




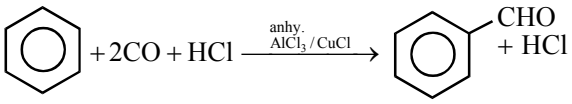
benzylidene diacetate

(iii) By side chain chlorination followed by hydrolysis(commercial method).





(iv) By Gatterman - koch reaction: In this reaction –H in benzene ring is converted into –CHO



PREPARATION OF ONLY KETONES:

1. **From acyl chloride and dialkyl cadmium:** Recently dialkyl cadmium is used for preparation of ketones from acyl halide in the presence of R–MgX. Since ketone formed in reaction do not react further to preduce 3^0 alcohol. It may be noted that R–MgX can not be used in place of dialkyl cadmium, this is because ketone formed further react with R–MgX to give 3^0 alcohol.

   Dialkyl cadmium is obtained by reacting R–MgX with cadmium chloride

   $2R–MgX + CdCl_2 \rightarrow R_2Cd + 2MgXCl$

   When acyl halide reacts with R_2Cd in the presence of dry ether gives ketones.

   $$2R-COX + R_2Cd \xrightarrow{\text{dry ether}} 2R-COR + CdX_2$$

   e.g. $2CH_3COCl + (CH_3)_2\,Cd \xrightarrow{\text{dry ether}} 2CH_3COCH_3 + CdCl_2$

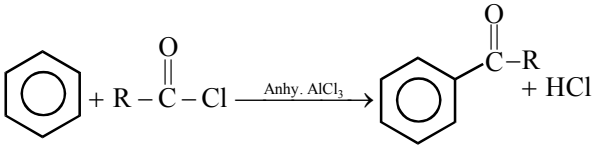
2. **From cyanide or nitrile and RMgX:** When alkyl cyanide is reacted with RMgX in the presence of dry ether, gives addition product, which on acid hydrolysis, gives ketone

   $$\underset{\text{alkane nitrile}}{R-C\equiv N} + R-MgX \xrightarrow{\text{dry ether}} \underset{\text{Mg complex}}{R-\overset{R}{\overset{|}{C}}=N-MgX}$$

   $$R-\overset{R}{\overset{|}{C}}=N-MgX + 2H_2O \xrightarrow{H^+} R-CO-R + NH_3 + MgXOH$$

   Ketone

3. **From Friedel-Craft acylation reaction:**



alkyl phenyl ketone

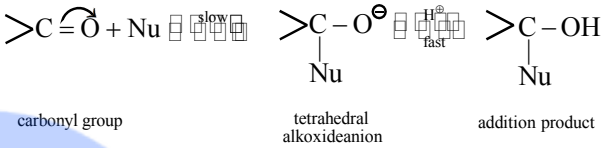
CHEMICAL PROPERTIES:

Mechanism in Nucleophilic addition reactions:

The carbonyl group has two active centre which can, be easily attacked. The positively changed carbon is easily attacked by nucleophile and negaively charged oxygen is easily attacked by electrophile.

During addition reaction nucleophile attack first and followed by electrophile, because anion produced is more stable than cation.

During the nucleophilic addition reaction hybridisation of carbonyl carbon atom changes from sp^2 to sp^3.



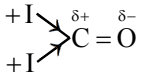
carbonyl group — tetrahedral alkoxideanion — addition product

Note: If attacking nucleophile is weak i.e. ammonia and its derivatives the reaction is carried in weakly acidic medium.

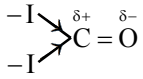
Reactivity: Aldehydes are more reactive than ketone in nucleophilic addition reaction due to steric and electronic reasons (inductive effect). Aliphatic aldehydes and ketones are more reactive than aromatic aldehydes and ketones.

(i) Inductive effect: Reactivity of carbonyl group depends upon magnitude of positive charge on carbonyl carbon atom, more the positive charge On carbonyl carbon atom more will be the reactivity of carbonyl compounds.

Electron donating group decreases the magnitude of positive charge on carbonyl carbon atom, hence I reactivity decreases. Electron withdrawing I groups increases the reactivity of carbonyl compounds by increasing positive charge on carbonyl carbon atom.



positive charge on carbonyl carbon atom decreases



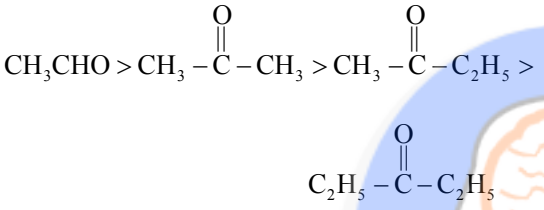
positive charge on carbonyl carbon atom increases. Thus reactivity is

$H–CHO > CH_3 – CHO > C_2H_5–CHO >$

$CH_3COCH_3 > C_6H_5CHO > C_6H_5COC_6H_5$

$CCl_3 – CHO > CHCl_2 – CHO > CH_2Cl – CHO > CH_3 – CHO$

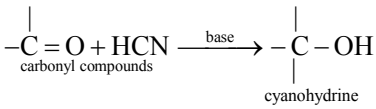
(ii) Steric effect: In aldehydes only one alkyl group is attached to carbonyl carbon atom hence attack is relatively more easy. In ketones two alkyl groups are attached to carbonyl carbon atom. Which hinders the approach of nucleophile, hence attack, is relatively difficult. This factor is also called as steric hinderence. In other word,more the steirc hinderence less the reactivity of carbonyl compounds.



(i) Addition reactions :

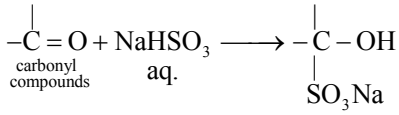
1. Addition of HCN (Prucic acid): When aldehydes and ketones are reacted with HCN in presence of base gives corresponding cyanohydrins. In this reaction oxygen atom in carbonyl group is changed to OH group.

Practically, HCN need for the reaction is generated in situ from dil. HC1 and NaCN. The amount of acid is insufficient to react whole NaCN. Hence, solution remain alkaline and which catalysed the reaction.



2. Addition of sodium bisulphite ($NaHSO_3$):

When Aldehydes and ketones are reacted with 40% aqueous saturated solution of $NaHSO_3$, gives corresponding crystalline bisulphite addition compounds. The reaction involves the nucleophilic attack of sulphite ion (SO_3--).



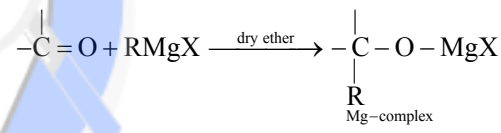
Note:

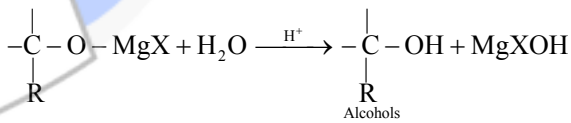
(i) Some ketones like diethyl ketone, acetophenone do Hot undergo this reaction.

(ii) The bisulphite 'addition product of aldehyde and ketone are crystalline solid and therefore this reaction is used in the separation of aldehydes and ketones from non carbonyl compounds.

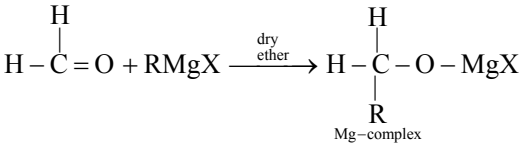
(iii) As the reaction is reversible the addition product can be dissolved by dilute mineral acid or aqueous tilkalies to regenrate original aldehydes and ketones. Hence this reaction used to purification of aldehydes and ketones.

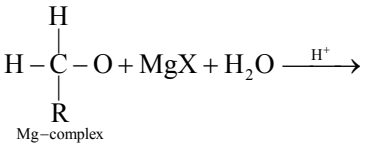
3. Addition of RMgX: When carbonyl compounds are reacted with Grignards reagent in the presence of dry ether give addition product which on acid hydrolysis gives alcohols (may be 1^0 or 2^0 or 3^0 alcohols).





(a) **On formaldehyde:** (In this reaction > C = O group is converted into -CH2OH primary alcohol)



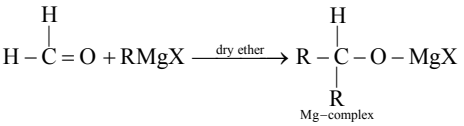


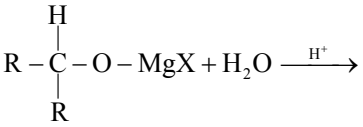
$R–CH_2–OH + MgXOH$

primary alcohol

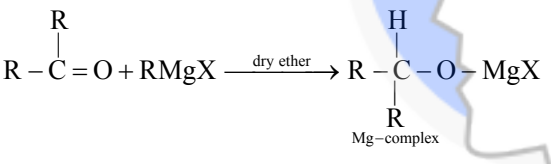
(b) **On aldehyde (RCHO):** When aldehydes (except HCHO) are reacted with RMgX in the presence of dry ether, gives Mg complex; Which on acid hydrolysis, gives secondary alcohols.

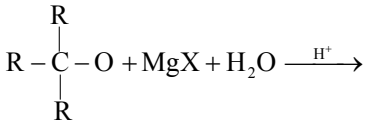
(In this reaction > C = O group is converted into >CH–OH sec. alcohol.)

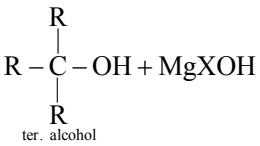




(c) On ketone: When ketones are reacted with RMgX in the presence of dry ether, gives Mg complex. Which on acid hydrolysis, gives tertiary alcohols. (In this reaction >C=O group is converted into >C—OH tertiary alcohol.)







Note: Using RMgX carbonyl compounds are convert into following.

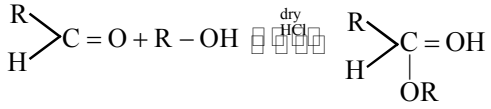
(1) Formaldehyde into $-CH_2-OH$ (primary alcohols),

(2) Aldehyde into > CH–OH (secondary alcohols)

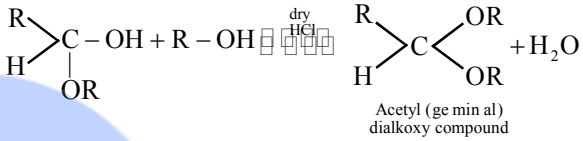
(3) Ketone into >C—OH (tertiary alcohols)

4. Addition of R–OH: Aldehydes or ketones are reacts with alcohols to form acetal or ketals.The acetal is used as table sugar, wooden shop, cotton fibrics etc

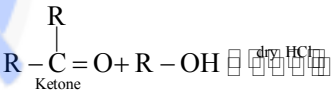
(a) Aldehyde: Aldehyde reacts with alcohol in the presence of presence of dry HC1 gas to give alkoxy alcohol (hemiacetal) or half acetal which reacts with another molecule to form acetal.

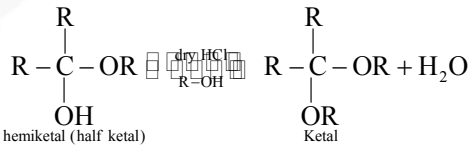


alkoxy alcohol (hemiacetal) or half acetal



(b) Ketone: Ketone reacts with alcohol in the presence of presence of dry HCI gas to give hemiketal of half ketal, which reacts with another molecule to form ketal.





Note:

(i) Dry hydrogen chloride protonates the oxygen of carbonyl compound and increase the electrophilicity of carbonyl carbon atom and increase the rate of reaction.

(ii) Acetal and ketal are hydrolysed by aq. HCl to give corresponding aldehydes and ketones.

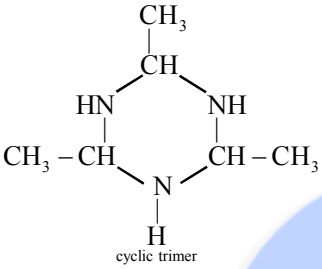
5. Addition of ammonia: Ammonia react differently with formaldehyde, acetaldehyde and acetone forming.

e.g.

i) $CH_3-\underset{\text{acetaldehyde}}{\overset{H}{\overset{|}{C}}}=O+NH_3 \xrightarrow{\text{dry ether}}$

$$CH_3-\overset{H}{\overset{|}{C}}-O \xrightarrow{-H_2O} CH_3-CH=NH$$
$$\underset{\text{acetaldehyde amine}}{NH_2} \qquad \underset{\text{aldimine}}{}$$

$$3CH_3-CH=NH \xrightarrow{\text{trimerisation}}$$
$$\underset{\text{aldimine}}{}$$



cyclic trimer

(ii) $6HCHO + 4NH_3 \xrightarrow[\Delta]{\text{dry ether}}$

methanal

$$(CH_2)6N_4 + 6H_2O$$
urotropine

Note: Urotropin is condensation product of methanal and ammonia, it is not addition product.

(iii) $CH_3-\underset{\text{acetone}}{\overset{CH_3}{\overset{|}{C}}}=O+H_2-CH-\overset{O}{\overset{\|}{C}}-CH_3 \xrightarrow{NH_3/\Delta}$

$$CH_3-\overset{CH_3}{\overset{|}{C}}=CH-\overset{O}{\overset{\|}{C}}-CH_3+H_2O$$
$$\underset{\text{mesityl oxide}}{}$$

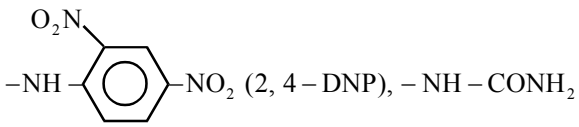
$$CH_3-\overset{CH_3}{\overset{|}{C}}=CH-\overset{O}{\overset{\|}{C}}-CH_3+NH_3 \xrightarrow{\text{M. R.}}$$
$$\underset{\text{acetone}}{}$$

$$CH_3-\overset{CH_3}{\overset{|}{\underset{NH_2}{\underset{|}{C}}}}-CH_2-\overset{O}{\overset{\|}{C}}-CH_3$$
diacetone amine

II. CONDENSATION REACTIONS OR ADDITION FOLLOWED BY ELIMINATION OR REPLACEMENT OF OXYGEN:

$$>C=O+H_2N-Z \xrightarrow{\text{acid}} -\overset{|}{\underset{NHZ}{\underset{|}{C}}}-OH \longrightarrow$$
$$>C=N-Z+H_2O$$

Where Z = R–, C_6H_5–, –OH, –NH_2, C_6H_5NH–,



(semicarbazide)

1. Reaction with R–NH_2:

$$>C=O+R-NH_2 \xrightarrow{\text{acid}} \underset{\text{substituted imine}}{>C=NR}+H_2O$$

2. Reaction with Ph–NH_2:

$$-\overset{|}{C}=O+H_2N-C_6H_5 \xrightarrow{\text{acid}} -\overset{|}{C}=N-C_6H_5+H_2O$$
phenyl imine (schiffs base)

3. Reaction with hydroxyl amine :

$$-\overset{|}{C}=O+NH_2-OH \xrightarrow{\text{acid}} \underset{\text{oxime}}{-\overset{|}{C}=NOH}+H_2O$$

4. Reaction with hydrazine: When aldehydes and ketones are heated with hydrazine in the presence of dilute acid undergoes condensation, gives corresponding crystalline red or orange colour hydrazone.

In this reaction >C = O group is converted into >C = NNH_2.

$$-\overset{|}{C}=O+H_2N-NH_2 \xrightarrow{\text{acid}} \underset{\text{hydrozone}}{-\overset{|}{C}=N.NH_2}+H_2O$$

5. Reaction with phenyl hydrazine: When aldehydes and ketones are heated with phenyl hydrazine in the presence of dilute acid undergoes condensation, gives corresponding crystalline red or orange colour phenyl hydrazone. In this reaction

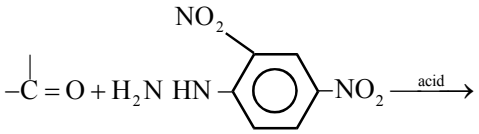
> C = O group is converted into >C = $NNHC_2H_5$.

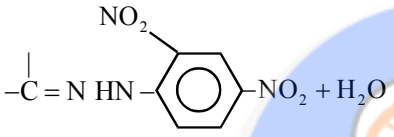
$$-\overset{|}{C}=O + H_2N-NHC_6H_5 \xrightarrow{acid} -\overset{|}{C}=N.NHC_6H_5$$
phenyl hydrazone

6. Reaction with $H_2NNH - CO - NH_2$ (semicarbzide)

$$-\overset{|}{C}=O + H_2NNHCONH_2 \xrightarrow{acid} -\overset{|}{C}=NNHCONH_2$$
semicarbazone

7. Reaction with 2,4-dinitrophenyl hydrazine (2,4-DNP)





2, 4, dinitrophenyl hydrozone (yellow)

III. REDUCTION

Catalytic hydrogenation or reduction by using $NaBH_4$ or $LiAlH_4$ OR Na.Hg + H_2O:

1. Catalytic hydrogenation: When aldehydes and ketones are reduced by passing hydrogen gas in the presence of Ni or Pt or Pd. at 413K to 453K, gives 1^0 or 2^0 alcohols.

(a) Aldehydes on reduction gives primary alcohols.

$$\underset{\text{aldehyde}}{RCHO} + H_2 \xrightarrow{Ni\ 413\ K} \underset{\text{primary alcohols}}{R-CH_2OH}$$

(b) Ketones on reduction gives secondary alcohols.

$$\underset{\text{ketones}}{R-\overset{R}{\overset{|}{C}}=O} + H_2 \xrightarrow{Ni\ 413\ K} R-\overset{R}{\overset{|}{CH}}-OH$$
sec. alcohols

2. Reduction by using NaHg + H_2O: When aldehydes and ketones are reduced by Na.He + H_2O or ZnHg + CH_3COOH or $LiAlH_4$, $NaBH_4$ gives 1^0 or 2^0 alcohols. Note that $NaBH_4$ does not reduce ketone group.

$$Na.Hg + H_2O \longrightarrow NaOH + Hg + [H]$$

(a) Aldehydes on reduction gives primary alcohols.

$$\underset{\text{aldehyde}}{R-CHO} + 2[H] \xrightarrow{NaHg+H_2O} \underset{\text{primary alcohol}}{RCH_2OH}$$

(b) Ketones on reduction gives secondary alcohols.

$$\underset{\text{ketones}}{R-\overset{R}{\overset{|}{C}}=O} + 2[H] \xrightarrow{NaHg+H_2O} R-\overset{R}{\overset{|}{CH}}-OH$$
sec. alcohol

Note: Unsaturated aldehydes or ketones can be reduced to unsaturated alcohols without affecting >C =C< by using $LiAlH_4$ or $NaBH_4$.

3. Clemmenson reduction (deoxygenation): In this reaction > C = O group is converted into $>CH_2$ (methylene) group.

e.g. When methanal is reduced by Zn. Hg + conc. HC1 gives methane.

$$\underset{\text{aldehyde}}{R-CHO} + 4[H] \xrightarrow[\Delta]{ZnHg+conc.H} R-H + H_2O$$
alkane

4. Volf-Kishner reduction: In this reaction > C = O group is reduced to > CH_2 group.

$$-\overset{|}{C}=O + NH_2-NH_2 \xrightarrow{acid} -\overset{|}{C}=N\ NH_2 + H_2O$$
hydrazone

$$-\overset{|}{C}=N.\ NH_2 \xrightarrow[\text{glycol }\Delta]{KOH+\text{ethylene}} -\overset{|}{CH_2} + N_2\uparrow$$

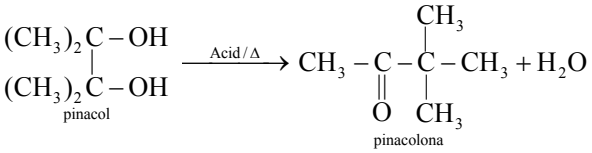
5. Reduction by Mg metal only ketone (Only for ketones): Only ketone give this reaction. When acetone is reacted with Mg metal in the presence of benzene gives Mg-complex, which on acid hydrolysis produces pinacol (2,3-dimethyl butane 2, 3-diol).

$$\begin{matrix}(CH_3)_2CO\\(CH_3)_2CO\end{matrix} + Mg \xrightarrow{Benzene}$$

$$\begin{matrix}(CH_3)_2C-O\\|\\(CH_3)_2C-O\end{matrix}\!\!>Mg \xrightarrow[H^+]{2H_2O}$$

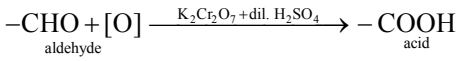
$$\begin{matrix}(CH_3)_2C-OH\\|\\(CH_3)_2C-OH\end{matrix} + Mg(OH)_2$$
pinacol

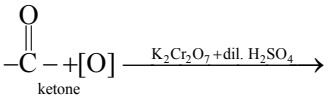
When pinacol is heated with acid undergoes rearrangement gives pinacolone. **This is known as pinacol-pinacolone rearrangement.**

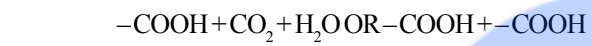


IV Oxidation reactions:

1. Oxidation by strong oxidising agent like $K_2Cr_2O_7$ + dil. H_2SO_4





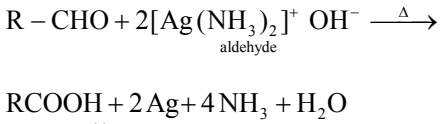


acid

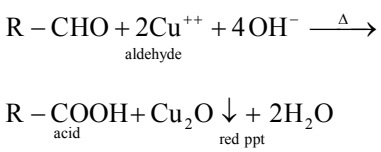
2. Oxidation by mild oxidising agents like Tollen's reagent, Fehling solution, Schiffs reagent, or Reducing properties of aldehydes or characteristic test of aldehydes or distinction test of aldehydes from ketones or reducing reaction of aldehydes.

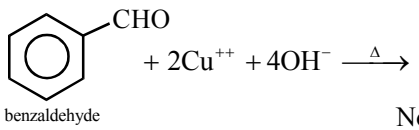
Aldehydes and ketones are distinguished by Tollen's reagent, Fehling solution, Schiffs reagent.

(i) Reaction with Tollens reagent:



(ii) Reaction with Fehling solution:

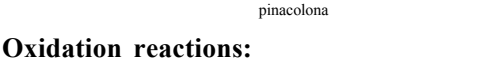




benzaldehyde

No reaction

(iii) Reaction with Schiffs reagent: Schiffs reagent (colourless) is prepared by passing SO_2 gas in magenta or pink dye of para-rosaniline hydrochloride (Fuschin). When decolourised schiffs reagent is treated with aldehyde in cold original pink or magenta colour is developed.



or magenta or bright crimson colour.

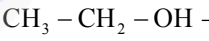
Note : Ketones does not give these reactions because of absence of H-atom on carbonyl carbon atom. Glucose, formic acid and enolic form of fructose gives above test.

3. Oxidation of methyl ketone by haloform reaction (Haloform test):

Haloform test means preparation of haloform i.e. $CHC1_3$ (colourless liquid), CHI_3 (yellow solid) and $CHBr_3$ (brown liquid). This test is given by some alcohols, some aldehydes and some ketones.

Alcohols: Alcohols that produces CH_3–CO group (methyl ketone or 2-one group) on oxidation gives haloform test or oxidative product of alcohols contain 3–α–H atoms on single carbon atom gives haloform test.

Negative haloform test



Positive haloform test

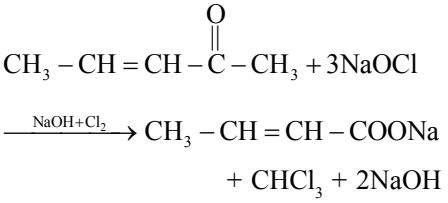
Aldehydes and ketones: They contain CH_3–CO group (methyl ketone or 2-one group) or 3–α–H atoms on single carbon atom.

H – CHO	Negative haloform test
CH_3 – CHO	Positive haloform test
CH_3CH_2–CHO	Negative haloform test

CH_3–CH_2–CO–CH_2–CH_3

Negative haloform test

Note : The importance of this reaction is, if >C = C < present in molecule is not attacked by NaOX.

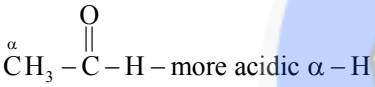


V. Reaction due to α-H atom

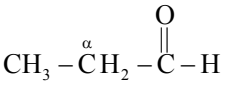
1. Acidity of α-H atom in aldehydes and ketone:

Aldehydes and ketones undergoes number α-reactions due to acidic nature of α-H atom. The acidity of α-H depends upon electron withdrawing group (– I effect) of carbonyl group and resonance stabilisation of conjugate base.

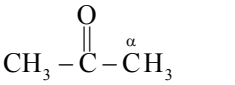
When α-H atom is attached to only carbonyl group, then more acidic is α-H atom



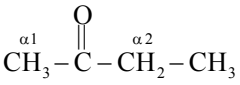
When α-H atom is attached to only carbonyl group and alkyl group, then less acidic will be the α-H atom.



– less acidic α-H



– less acidic α-H



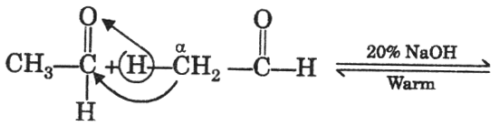
– α_1 is more acidic than α_2

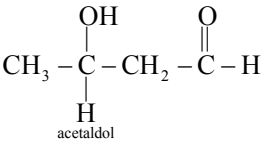
Note: In aldol condensation reaction more acidic α-H atom involved in condensation reaction.

VI. Aldol condensation reaction or self condensation or reaction with dilute alkali or 10% alkali or weak alkali:

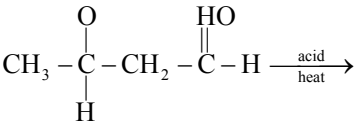
1. simple aldol condensation reaction: It is the reaction between two same aldehydes or two same ketones.

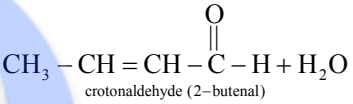
e.g. When acetaldehyde is warmed with dil. (10%) NaOH, gives acetaldol (3-hydroxy butanal). Which on heating with acid loses water molecule and gives crotonaldehyde (α-β unsaturated aldehyde).





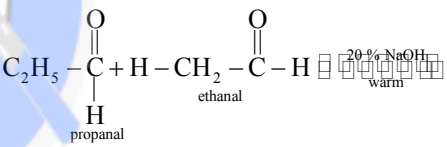
acetaldol





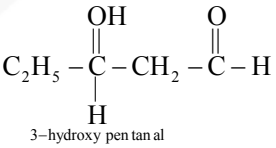
crotonaldehyde (2–butenal)

Cross aldol condensation reactions:

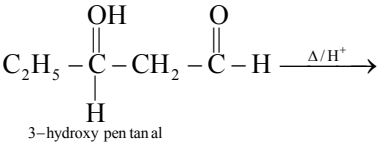


ethanal

propanal



3–hydroxy pen tan al

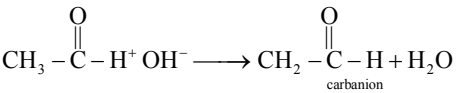


3–hydroxy pen tan al

C_2H_5–CH = CH – CHO + H_2O

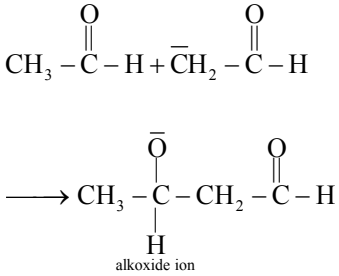
Mechanism of aldol condensation reaction:

Step-I: Base OH^- takes α-H-atom from aldehyde to form carbanion(enolate ion).

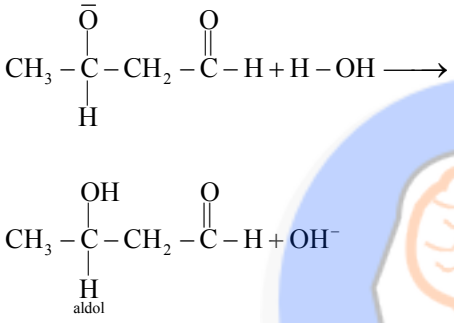


carbanion

Step-II: The carbanion attack electrophilic carbonyl carbon of second aldehyde molecule to form alkoxide ion.



Step-III: Alkoxide ion takes hydrogen ion from water to form aldol. Base OH^- ion is generated.



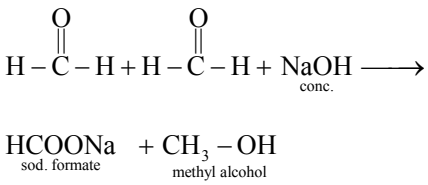
Note: Formaldehyde, benzaldehyde, trimethyl acetaldehyde, benzoquinone, chloral, iodal etc does not give this reaction because of absence of α-hydrogen atoms.

VII. CANNIZZARO'S REACTION OR SELF REDOX REACTION OR BASE CATALYSED SELF OXIDATION REDUCTION REACTION :

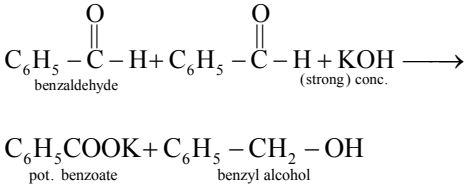
Condition: It is a characteristics reaction of aldehydes and ketones which does not contain α-H atom. It is carried by strong alkali.

e.g.

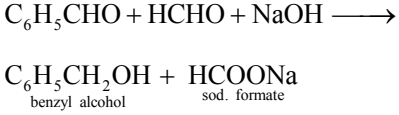
(i) When formaldehyde is heated with cone. (50%) NaOH, gives sodium formate and methyl alcohol.



(ii) When benzaldehyde (benzene carbaldehyde) is heated with strong KOH, gives pot. benzoate and benzyl alcohol.



(iii) **Cross Cannizzaro's reaction:** When benzaldehyde and formaldehyde are heated with strong NaOH gives benzyl alcohol and sodium formate. In this reaction more reactive aldehydes give oxidative product in crossed Cannizzaro's reaction.



Note: Isobutyraldehyde gives Cannizzaro's reaction eventhough presence of α-H atom. The exception behavior of isobutyraldehyde is due to +I effect of two alkyl groups.

e.g. $(CH_3)_2CH–CHO + (CH_3)_2 CH–CHO + NaOH \rightarrow$ conc.

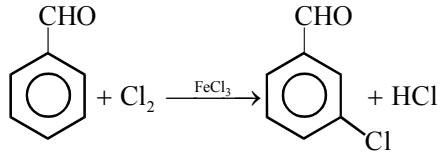
$(CH_3)_2CH–COONa + (CH_3)_2CH–CH_2OH.$

sod. iso-butyrate iso-butyl alcohol

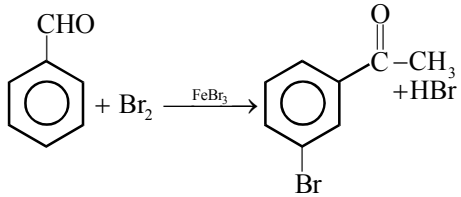
VIII. ELECTROPHILIC SUBSTITUTION REACTION OF AROMATIC ALDEHYDES AND KETONES:

Note that – CHO and > C = O group are meta directing

1. Halogenation :

i) 

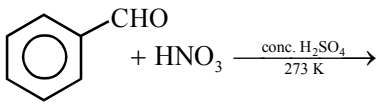
m – chlorobenzaldehyde

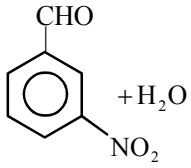
ii) 

m – bromoacetophenone

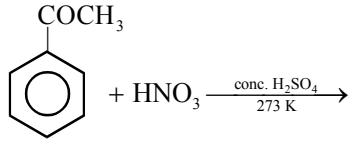
2. Nitration

e.g.

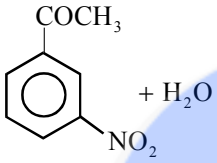
i) 



m – nitro benzaldehyde

ii) 

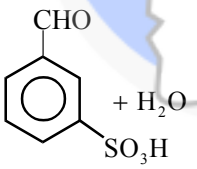
1 – phenyl ethan – 1 – one



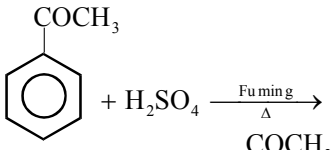
m – nitro acetophenone

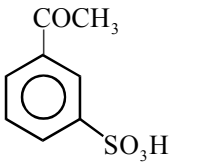
3. Sulphonation :

i) 



m – formyl benzene sulphonic acid

ii) 



m – oxo methyl benzene sulphonic acid

SECTION-II: CARBOXYLIC ACIDS

Definition: These are carboxyl derivatives of alkane obtained by replacing hydrogen atom from alkane by carboxyl (–COOH) group.

ISOMERISM

Carboxylic acids: They shows chain, optical isomerism themselves and functional isomerism with esters. Total number of isomeric acids can be calculated by formula, $\mathbf{I = 2^{n-3}}$.

Esters : They shows chain, metamerism, optical isomerism themselves and functional isomerism with carboxylic acids.

Total number of isomeric esters can be calculated by formula, $\mathbf{I} = 2^{n-1} = (n-2) - 2n^{-3}$ from C_3 onwards.

Total number of isomeric acids and esters can be calculated by formula, $\mathbf{I} = 2^{n-1} - (n-2)$.

e.g.

(i) $C_2H_4O_2$ (2-isomers)
- (a) CH_3COOH acetic acid
- (b) $HCOOCH_3$ methyl formate

(ii) $C_3H_6O_2$ (3-isomers. 1 acid, 2 esters)
- (a) CH_3CH_2COOH propionic acid
- (b) $HCOOC_2H_5$ ethyl formate
- (c) CH_3COOCH_3 methyl acetate

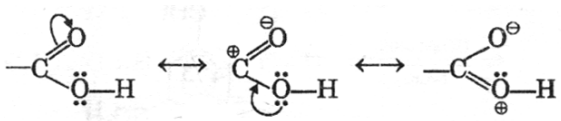
(iii) $C_4H_8O_2$ (6-isomers. 2 acids, 4 esters)

Acids:
- (a) $CH_3CH_2CH_2COOH$ n-butyricacid
- (b) $(CH_3)_2CHCOOH$ isobutyricacid

Esters :
- (a) $HCOOCH_2CH_2CH_3$ n-propyl formate
- (b) $HCOOCH(CH_3)_2$ isopropyl formate
- (c) $CH_3COOCH_2CH_3$ ethyl acetate
- (d) $C_2H_5COOCH_3$ methylpropionate

12.3 STRUCTURE OF -COOH GROUP

The carboxylic carbon is less electrophilic than carbonyl carbon atom in aldehydes and ketones because of resonance stabilisation of COOH group.



The carbon atom is sp^2 hybridised state. The O–C–O bond angle is 120^0.

PREPARATION METHODS

1. From oxidation of 1^0 alcohols, aldehydes and ketones.

(a) From primary alcohols: Primary alcohols on controlled oxidation by acidified $K_2Cr_2O_7$ gives Carboxylic acid.

$$-CHO + 2[O] \xrightarrow{K_2CR_2O_7 + dil.\ H_2SO_4} -COOH + H_2O$$

(b) From aldehydes : Aldehydes on oxidation by acidified $K_2Cr_2O_7$, gives carboxylic acid.

$$-CHO + 2[O] \xrightarrow{K_2CR_2O_7 + dil.\ H_2SO_4} -COOH$$

(c) From ketones: Ketones on controlled oxidation by acidified $K_2Cr_3O_7$ gives carboxylic acid.

$$>C=O + 2[O] \xrightarrow{K_2CR_2O_7 + dil.\ H_2SO_4} -COOH + H_2O + CO_2$$

2. From acid hydrolysis of cyanide or nitrile:

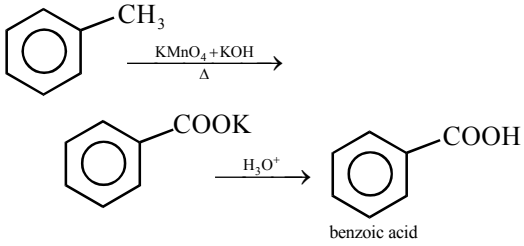
$$\underset{\text{alkyl cyanide}}{R-CO=N} + H_2O \xrightarrow[\Delta]{H^+} \underset{\text{acid amide}}{R-CONH_2} \xrightarrow[H^+]{H_2O} \underset{\text{acid}}{RCOOH} + NH_3$$

Note: Mild reaction conditions are used to stop reaction at amide stage.

$$-C\equiv N + H-OH \xrightarrow{H^+} \underset{\text{imine}}{-C(OH)=NH} \xrightarrow{\text{isomerise}} \underset{\text{amide}}{-C(=O)-NH_2}$$

3. From oxidation of alkyl benzene or phenyl alkene:

Alkyl benzene are oxidised by strong oxidising agent like chromic acid or acidic $KMnO_4$ or alkaline $KMnO_4$. The entire side chain is converted into carboxyl group irrespective of length of the side chain. Tertiary alkyl group donot under goes oxidation because of absence of benzylic hydrogen atom.



4. From dry ice and R–MgX :

$$\underset{\text{dry ice}}{O=C=O} + RMgX \xrightarrow{\text{dry ether}} \underset{\text{addition product}}{O=C(R)-OMgX}$$

$$O=C(R)-OMgX + H-OH \xrightarrow{H^+} \underset{\text{acid}}{RCOOH} + MgXOH$$

5. From hydrolysis of acid halide and acid anhydride:

(a) Acid halide is hydrolysed with water gives corresponding acids.

$$R-COCl + H-OH \longrightarrow R-COOH + HCl$$

Note: Acid chloride are more readily hydrolysed by aqueous base to give carboxylate ion, which on acidification gives corresponding acids.

$$R-COCl + OH^- \longrightarrow R-COO^- + HCl^-$$

$$R-COO^- \xrightarrow{H^+} R-COOH$$

(b) Acid anhydride is hydrolysed by water gives acids

$$(R-CO)_2O + H_2O \longrightarrow 2R-COOH$$

6. Acid hydrolysis of esters by using dil. HC1 or dil. H_2SO_4:

$$\underset{\text{ester}}{R-COO-R} + H_2O \xrightarrow[\Delta]{\text{conc. } H_2SO_4} \underset{\text{acid}}{R-COOH} + \underset{\text{alcohol}}{R-OH}$$

Note: These are reverse of esterification reaction. It is auto catalysed reaction because acid formed in this reaction acts as catalyst.

7. Alkaline hydrolysis of ester (Saponification):

$$R-COO-R + NaOH \xrightarrow{\Delta} R-COONa + R-OH$$

ester aq. sod. salt of acid alcohol

$$R-COONa + H-OH \xrightarrow{H^+} R-COOH + NaOH$$

Note :

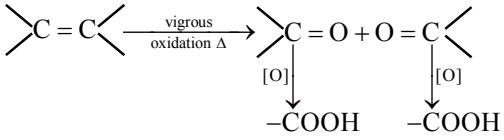
(i) Acid hydrolysis and alkaline hydrolysis of esters are nucleophilic substitution reaction.

(ii) Hydrolysis of ester by dilute alkali is irreversible and faster reaction than acid hydrolysis.

(iii) Alkaline hydrolysis of ester is preferred over acid hydrolysis because the acid salt formed can not force backward reaction.

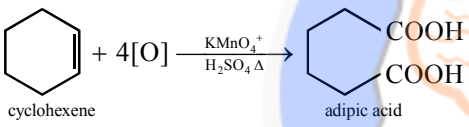
(iv) Reactions of ester with RMgX are nucleophilic addition reactions.

8. Oxidation of alkene by strong oxidising agent (vigrous oxidation):



e.g.

i) $CH_2 = CH_2 + 4[O] \xrightarrow[H_2SO_4\ \Delta]{KMnO_4^+} 2H - COOH$

ii) 

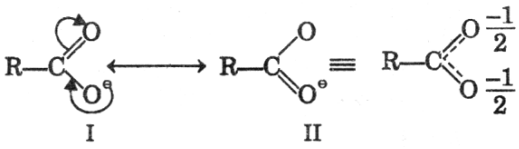
ACIDIC NATURE OF ALIPHATIC ACID

1. Acidic nature of carboxylic acid can be best explained on the basis of resonance and Lowry Bronsted theory.

2. Carboxylic acid are weak acids and turns blue litmus to red. In water they are , partially dissociated and equilibrium is shifted in left side. Thus, aqueous solution of carboxylic acid contains, more undissociated acid molecules.Carboxylic acids are stronger acid than R–OH, C_6H_5–OH, water and weaker than mineral acids.

$$RCOOH + H_2O \rightleftharpoons RCOO^- + H_3O^+ + RCOOH$$

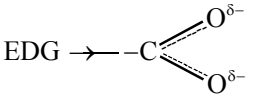
3. Carboxylate ion is best stablised by resonance hence these are acidic in nature.



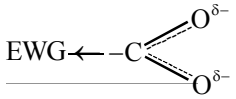
4. Acidic strength can also be explain on the basis of Ka and Pka values. More the Ka value or less the pKa value more the acidic strength and vise versa.

Acidic nature:

1. Electron donating groups (+1) effect i.e. $NH_2 > OH > OCH_3 > CH_3$ destabilize the anion, by intensify negative charge and thus decrease the acidity of acid.



2. Electron withdrawing groups (–I) effect, i.e. $CF_3 > NO_2 > CN > F > Cl > Br > I > C_6H_5$ stabilize the anion, by dispersing negative charge and thus increase the acidity of acid.



Which is depends up on following factors:

(a) The number of electron attracting groups or atoms (–I effect) increases, the strength of acid increases. The order of acidity

e.g. $CCl_3COOH > CHC1_2COOH > CH_2C1COOH > CH_3COOH$

(b) The power electron attracting groups or atoms increases, the acidity increases.

e.g. $CH_2FCOOH > CH_2C1COOH > CH_2BrCOOH$

(c) The distance of electron attracting groups or atoms from carboxylic group increases, acidity decreases. Therefore, decreasing acidity order in n-butyric acid is $\alpha > \beta > \gamma > \delta$. Inductive effect is stronger at a-position than α-position, similarly at β-position it is more stronger than γ-position.

e.g.

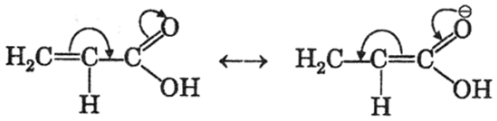
$\overset{\gamma}{C}H_3\overset{\beta}{C}H_2\overset{\alpha}{C}HClCOOH > CH_3CHClCH_2COOH >$

$CH_2ClCH_2CH_2COOH > CH_3CH_2CH_2COOH$

(d) More the power of electron withdrawing group, strength of carboxylic acid increases.

$CH_3–CH_2–COOH < H–CH_2–COOH < C_6H_5CH_2–COOH < O–CH_2–COOH < C1–CH_2–COOH$

(e) Direct attachment of groups such as phenyl (C_6H_5–) or vinyl (CH_2 = CH–) or acetylenic (CH = C–) to –COOH group, increases the acidity of corresponding carboxylic acid.This is due to more electronegative sp^{2-} and sp-hybridised carbon atom to which –COOH group is attached.



e.g.

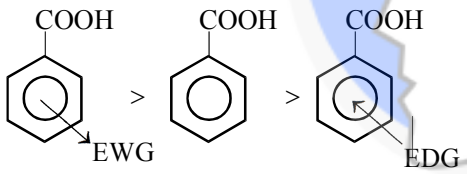
(i) H–COOH > C_6H_5 – COOH > $C_6H_5CH_2$ COOH > CH_3COOH > C_2H_5COOH

(ii) CH = C–COOH > C_6H_5COOH > CH_2 = CH – COOH

(C_6H_5 group is more electron withdrawing than CH_2 = CH–).

ACIDIC NATURE IN AROMATIC ACID

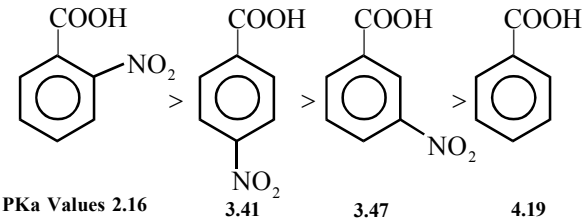
In aromatic carboxylic acid electron donating group decrease the acidic strength while electron with drawing group increase the acidic strength



1. Electron donating groups decrease the acidic length of acids by destabilizing benzoate ion. It follows the order, Ph – COOH > o > m > p

2. Electron withdrawing groups increase the acidic strength of acids by stabilizing benzoate ion.

It follows the order, o > p > m > Ph-COOH



PKa Values 2.16 3.41 3.47 4.19

REACTION SHOWS THE ACIDIC NATURE OF CARBOXYLIC ACIDS

1. Reaction with metal: (Na, K, Ca, Zn)

(a) Reaction with Na metal:

$2R - COOH + 2\ Na \rightarrow 2R–COONa + H_2$

(b) Reaction with potassium metal:

$2R–COOH + 2K \rightarrow 2R–COOK + H_2$

(c) Reaction with calcium metal:

$2R–COOH + Ca \rightarrow (R–COO)_2\ Ca + H_2$

(d) Reaction with Zn metal:

$2R–COOH + Zn \rightarrow (R–COO)_2\ Zn + H_2$

2. Reaction with strong alkali (NaOH, KOH):

(a) Reaction with NaOH:

$R–COOH + NaOH \rightarrow R–COONa + H2O$

(b) Reaction with KOH:

$R–COOH + KOH \rightarrow \underset{\text{pot. formate}}{R–COOK} + H_2O$

3. Reaction with weak alkali ($NaHCO_3$, Na_2CO_3, NH_4OH):

(a) Reaction with $NaHCO_3$ (sodium bicarbonate or baking soda):

$$R - COOH + NaHCO_3 \xrightarrow{Fast} R - COONa + CO_2 + H_2O$$

(b) Reaction with Na_2CO_3 (Sodium carbonate):

$$2R - COOH + Na_2CO_3 \xrightarrow{Slow} 2R–COONa + CO_2 + H_2O$$

(c) Reaction with NH_4OH (ammonium hydroxide):

$R–COOH + NH_4OH \rightarrow R–COONH_4 + H_2O$

4. Reaction involving breaking of C–O bond (Nu-SR)

(a) Formation of anhydride (Reaction with conc. H_2SO_4 or P_2O_5)

1. From P_2O_5

$$\underset{\text{acid}}{\underset{+}{\underset{R - COOH}{R - COOH}}} \xrightarrow[\Delta]{P_2O_5} \underset{R - CO}{\overset{R - CO}{\rangle}}O + H_2O$$

$$P_2O_5 + H_2O \longrightarrow \underset{\text{meta phosphoric acid}}{2HPO_3}$$

Note: Formic acid does not form formic unhydride $(H–CO)_2O$, When it is heated with P_2O_5, undergoes dehydration forming CO.

$$H - COOH \xrightarrow[\Delta]{P_2O_5} CO + H_2O$$

2. From acyl chloride and sodium salt of carboxylic acids:

$$R-COCl + R-COONa \xrightarrow{\text{Pyridine}} R-COOOC-R + NaCl$$

(b) Esterification (Fischer esterification) OR Alcoholy sis of acids OR Acy lation of alcohols.

$$\underset{\text{acid}}{R-COOH} + \underset{\text{alcohol}}{R'-OH} \xrightarrow[\Delta]{\text{conc. } H_2SO_4} R-COO-R' + H_2O$$

ester

Note:

(i) These reactions are reversible in nature.

(ii) The yield of ester may increased by using excess of alcohol or removal of water by distillation or excess of acid. Water may be removed by using concentrated H_2SO_4 or dry HC1 or anhydrous $ZnCl_2$.

(iii) The concentrated H_2SO_4 or dry HC1 or anhydrous $ZnCl_2$ acts as mainly dehydrating agent and it also act as catalyst in the esterification reaction.

(iv) These are nucleophilic substitution reaction.

(v) The reaction is shifted to the right by using excess of alcohol or removal of water by distillation.

(vi) The greater the bulk of the substituents near the OH group of alcohol and –COOH group of acid, the slower is the rate of esterification due to stearic hindrance.

Thus, the reactivity of alcohol towards esterification is:

$CH_3OH > C_2H_5OH > C_3H_7OH > C_4H_9OH$

Similarly the reactivity of carboxylic acid increase as:

$HCOOH > CH_3COOH > C_2H_5COOH > (CH_3)_2CHCOOH$

(vii) The reverse of esterification is known as hydrolysis which may effected by acids or alkalies.

(viii) The mechanism of esterification is detected by **tracer technique** by taking isotopic oxygen in alcohol. After esterification isotopic oxygen become in ester. This indicate that during esterification the cleavage of C–O bond of carboxylic acid and O–H bond of alcohol.

$$R-\overset{\overset{O}{\|}}{C}-OH + R-\underset{\underset{8}{\downarrow}}{O}-H \xrightarrow{\text{conc. } H_2SO_4} R-\overset{\overset{O}{\|}}{C}-\underset{\underset{18}{\downarrow}}{O}-R + H_2O$$

(c) Reaction with PCl_3, PCl_5 and $SOCl_2$

$3RCOOH + PCl_3 \rightarrow 3RCOCl + H_3PO_3$

$RCOOH + PCl_5 \rightarrow RCOCl + POCl_3 + HCl$

$RCOOH + SOCl_2 \xrightarrow{\text{Pyridine}} RCOCl + SO_2 + HCl$

When acid chloride is heated with ammonia gives acid amide.

$RCOC1 + NH_3 \rightarrow RCONH_2 + HC1$

(d) Reaction with ammonia :

When carboxylic acid is reacted with ammonia, gives ammonium salt of acid. Which on heating loses water molecule and gives amide.

$R–COOH + NH_3 \rightarrow R–COONH_4$

$R-COONH_4 \xrightarrow{\Delta} R-CONH_2 + H_2O$

3. Reaction involving – COOH group

Reduction by using $LiAlH_4$ or diborane (B_2H_6) as reducing agent or hydrogen in the presence of copper chromite ($CuO, CuCr_2O_4$) as catalyst: Carboxylic acid are reduced by using $LiAlH_4$ as catalyst gives primary alcohols. The > C = O group is reduced to > CH_2 group.

$$R-COOH + 4[H] \xrightarrow[(ii)\ H_3O^+]{(i)\ LiAlH_4/\text{ether}} R-CH_2OH + H_2O$$

$$CH_3-COOH + 4[H] \xrightarrow[(ii)\ H_3O^+]{(i)\ LiAlH_4/\text{ether}} CH_3-CH_2OH + H_2O$$

Note: Sodium boronhydride (NaBH4) does not reduces carboxyl group.

(ii) Decarboxylation:

(a) Decarboxylation by using soda lime:

Sodium salt of carboxylic acid is heated with soda lime (NaOH+ CaO 3:1 ratio) gives alkane

$$R-COONa + NaOH \xrightarrow[\Delta]{CaO} R-H + NaCO_3$$

4. Halogenation (Hell-Vohlard-Zelinsky reaction) or HVZ reaction:

Carboxylic acids having α-H atom undergoes halogenation at only α-position in the presence of red phosphorus to give α-halo carboxylic acids.

$$R-CH_2-COOH + H_2 \xrightarrow[(ii)\ H_2O]{(i)\ Red.\ P} X = Cl, Br$$

$$R-\underset{\displaystyle X}{\underset{|}{CH}}-COOH + HCl$$

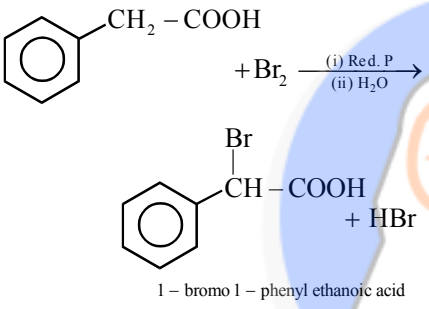
α-halo carboxylic acid

e.g.

i) $CH_3-COOH + Cl_2 \xrightarrow[(ii)\ H_2O]{(i)\ Red.\ P}$

$CH_2Cl–COOH + HCl$

chloroacetic acid

ii) 

1 – bromo 1 – phenyl ethanoic acid

The importance of this reaction is that only α-H is substituted.

i) $CH_3-COOH \xrightarrow{Br_2/Red\ P}$

$BrCH_2-COOH \xrightarrow{Br_2/Red\ P}$

$Br_2CH-COOH \xrightarrow{Br_2/Red\ P} Br_3C-COOH$

ii) $CH_3-CH_2COOH \xrightarrow{Br_2/Red\ P}$

$CH_3-CHBr-COOH \xrightarrow{Br_2/Red\ P}$

$CH_3-CBr_2-COOH \xrightarrow{Br_2/Red\ P}$

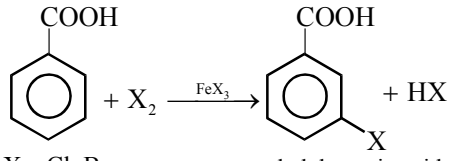
No reaction

12.8 ELECTROPHILIC SUBSTITUTION REACTION OF CARBOXYLIC ACIDS

Aromatic carboxylic acid undergoes electrophilic substitution reaction. Carboxyl group is meta directing.

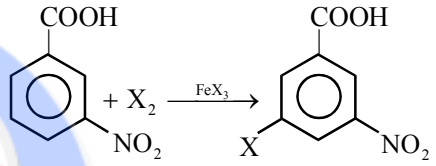
Note: Aromatic carboxylic acid never undergoes -Friedel Craft reaction because only, A1CL3, (Lewis acid) get bonded to carboxyl group. Other Lewis acid does not bonded to carboxyl group.

(i) Halogenation e.g.

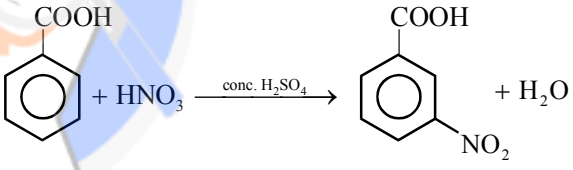


X = Cl, B

m – halobenzoic acid

(ii) 

Nitration e.g.



m – nitro benzoic acid


DGT

MULTIPLE CHOICE QUESTIONS

SECTION-I: ALDEHYDES AND KETONES

Introduction, Classification, Nomenclature, Isomerism, Structure Of > C = O Group

1. Aldehydes are characterised by the general formula

a) $C_nH_{2n}O$ b) C_nH_{2n}

c) $C_nH_{2n+}OH$ d) $C_nH_{2n+2}O$

2. Hybridisation of carbon in – CHO group is

a) sp b) sp^2

c) sp^3 d) none of these

3. Formalin is a

a) 100% solution of HCHO

b) 40% solution of HCHO

c) 60% solution of HCHO

d) 40% solution of CH_3COOH

4. An aldehyde group can be present

a) in between carbon chain

b) at any position in carbon atom

c) only at the end of carbon chain

d) at the second carbon atom of the carbon chain

5. Butanal is an example of

a) primary alcohol b) secondary alcohol

c) aliphatic aldehyde d) aliphatic ketone

6. In IUPAC system aldehydes are called

a) alkanes b) alkenes

c) alkanals d) alkanols

7. IUPAC name of mesityl oxide is

a) 4-methyl penta-3-none

b) 4-methyl pente-3-none

c) 4-methyl pent-3-en 2-one

d) 4-methyl pent-3-en 1-one

8. IUPAC name of pinacol is

a) 2,3-dimethyl butan 2,3-diol

b) 2,3-dimethyl butane 2,3-diol

c) 2,3-dimethyl 2-butanol

d) 2,3-dimethyl 3-butanol

9. IUPAC name of diacetone amine is

a) 2-methyl 4-keto 2-pentanamine

b) 4-amino 4-methyl 2-pentanone

c) 4-amino 2-pentanone

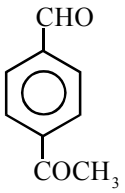
d) 4-amino 3-pentanone

10. The IUPAC name of crotonaldehyde is

a) pentenal b) but-2-en-l-al

c) but-2-an-l-al d) but-2-en-l-ol

11. IUPAC name of the following compound is



a) 4-formyl acetophenone

b) 4-ketomethyl benzaldehyde

c) 1-formyl 4-ketomethyl benzene

d) 4-formyl 1-ketomethyl benzene

12. IUPAC name of ketone is

a) alkanol b) alkanal

c) alkanone d) alkyl alkanoate

13. Tautomerism is possible in

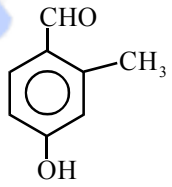
1. $CH_3–CHO$ 2. $CH_3–CO–CH_3$

3. H–CHO 4. $(CH_3)_3C–CHO$

a) 1, 2 b) 2 3

c) 3, 4 d) 1, 2, 4

14. IUPAC name of following compound will be



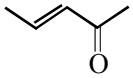
a) 4-formyl 3-methyl 1-hydroxy benzene

b) 4-formyl 3-methyl phenol

c) 4-hydroxy 2-methyl benzaldehyde

d) 4-hydroxy 2-methyl carbaldehyde

15. IUPAC name following compound is



a) 4-oxo pent-2-ene b) pent-2-en-4-one

c) 2-oxo-pent-3-ene d) pent-3-en-2-one

16. Which of the followingis 3-phenylprop-2-en-l-al?

a) $C_6H_5–CH = CH–CH_2–CHO$

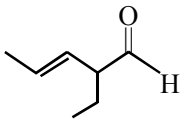
b) $C_6H_5–CH = CH – CHO$

c) $C_6H_5–CH_2–CHO$

d) $C_6H_5–CH = CH–CH_2–CH_2–CHO$

17. IUPAC name of benzophenone is
a) 2-phenyl propenal
b) 3-phenyl butenal
c) diphenyl methanone
d) diphenyl ethanone

18. IUPAC name of the following compound is



a) 2-(2-propenyl)butanal
b) 2-(l-propenyl)butanal
c) 4-formyl 4-ethyl but-2-ene
d) 2-ethyl pent-3-en-1-al

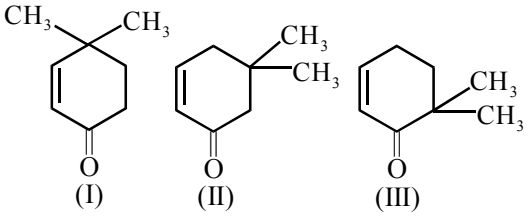
19. Aldehyde group can occur :
a) any where in carbon chain
b) in the middle of carbon chain
c) at only second carbon atom of carbon chain
d) only at end of the carbon chain

20. The carbon atom of carbonyl group is
a) sp^3-hybridise b) sp^2-hybridised
c) sp-hybridised d) sp^3-d-hybridised

21. $C_nH_{2n}O$ is general formula for
a) aldehydes
b) ketones
c) all carbonyl compounds
d) aldehyde and ketones

22. IUPAC name of p-methyl butyraldehyde
a) 2-methyl butanal b) 3-methyl butanal
c) 2-methyl propanal d) 3-methyl pentanal

23. Given :

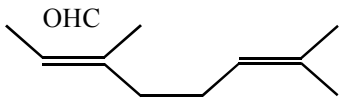


Which of the given compunds can exhibit tautomerism ?
a) I and II b) I and III
c) II and III d) I, II and III

24. IUPAC name of isobutyraldehyde is
a) 2-methyl propanone
b) 2-methyl propanal
c) 2-methyl propanone
d) methyl ethanoate

25. Which of the following is trimethyl acetaldehyde?
a) $(CH_3)_3C–CH_2–CHO$
b) $(CH_3)_3C–CH_2–CH_2–CHO$
c) $(CH_3)_3C–CHO$
d) $(CH_3)_2CH–CH(CH_3)CHO$

26. IUPAC name of the following compound is



a) 2-methIyl nona 2,6-dine-l-al
b) 3-methlyl nona 2,6-dine-l-al
c) 4,6-dimethyl hepta 3,5-dien-l-al
d) 3,7-dimethylocta2,6-dien-l-al

27. Aldehyde shows functional isomerism with
a) aliphatic ether
b) ketones
c) dimer of ethanoic acid
d) thio cyclic ether

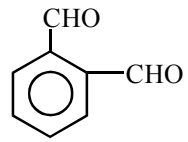
28. Pentan-2-one and 3-methyl butan-2-one are
a) chain isomers b) position isomers
c) metamers d) tautomers

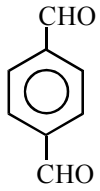
29. Tautomer of ethyl methyl ketone is
a) but-2-en-2-ol b) but-2-en-l-ol
c) but-2-en-l-oicacid d) prop-l-en-2-ol

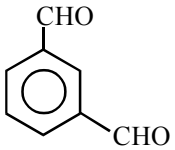
30. Which of the following is acrolein?
a) $CH_3–CH = CH–CHO$
b) $CH_2 = CH–CHO$
c) $CH_2 = CH–CH_2 – CHO$
d) $CH_2 = CH – CH_2 – CH_2 – CHO$

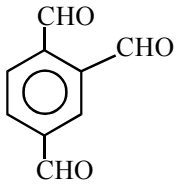
31. What is the IUPAC name of compound when -CHO group is attached to neoamyl group ?
a) 2-methyl propanal
b) 3-methyl propanal
c) 2, 2-dimethyl butanal
d) 3,3-dimethyl butanal

32. Which of the following is isophthaldehyde ?

a) 

b) 

c) 

d) 

33. What is the IUPAC name of compound when carbonyl carbon atom is attached to phenyl group and ethyl group

a) propanone bertzene
b) 1-phenylpropan-l-one
c) 2-phenylpropan-l-one
d) propiophenone

34. What is IUPAC name of compound when ketone group is attached to one isopropyl group and one t-butyl group ?

a) 2, 4, 4-trimethyl 3-pentanone
b) 2, 2, 4-trimethyl 3-pentanone
c) 2, 4-dimethyl 3-pentanone
d) 2, 2-dimethyl 3-pentanone

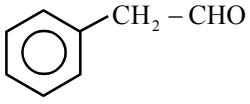
35. IUPAC name of ethyl isopropyl ketone is

a) 4-methyl pent-3-one
b) 2-methyl pent-3-one
c) 4-methyl pent-2-one
d) 2-methyl pent-2-one

36. IUPAC name of acrolein is

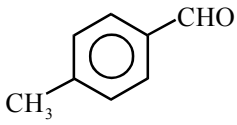
a) but-2-enal b) prop-2-enal
c) pentanal d) 2-methyl propanal

37. IUPAC name of the following compound is



a) Phenyl acetaldehyde
b) 1- Phenyl formyl methane
c) 2- Phenyl ethanal
d) 1- Phenyl methanal

38. Following compound is named as



a) 4-methyl cyclohexane carbaldehyde
b) 5-methyl cyclohexane carbaldehyde
c) γ-methyl cyclohexane carbaldehyde
d) both a and b

39. keto-enol tautomeric with

a) CH_3OH b) CH_3COCH_3
c) CH_3COOH d) CH_3COOCH_3

40. Ketones are isomeric with

a) alcohols b) aldehydes
c) ester d) acetic acid

41. The structural formula of the compound isomeric with acetone is

a) CH_3CH_2CHO b) CH_3CHO
c) CH_3CH_2OH d) none of these

42. $CH_3–CO–CH_3$ and $CH_2=COH–CH_3$ are

a) metamers
b) tautomers
c) geometrical isomers
d) optical isomers

43. Aldehyeds and ketone are

a) tautomers
b) chian isomers
c) funcational isomers
d) position isomers

44. Total number of isomeric aldehydes can calculated by formula

a) $I = 2^{n-2}$ b) $I = 2^{n-3}$
c) $I = 2^{n-2-1}$ d) $1 = 2^{-n}$

45. Total number of isomeric ketones can calculated by formula

a) $I = 2^{n-3} - 1$ b) $I = 2^{n-2}$
c) $I = 2^{n-2} - 1$ d) $I = 2^n$

46. Molecular formula C_3H_6O represents

a) aldehydes b) ketones
c) both 'a' and 'b' d) aldehydes and alcohols

47. C_3H_6O shows

a) chain isomerism b) position isomerism
c) metamerism d) functional isomerism

48. How many aldehydes are possible for molecular formula C_4H_8O ?
a) 2 b) 3
c) 4 d) 5

49. How many ketones are possible for molecular formula C_4H_8O?
a) 1 b) 2
c) 3 d) 4

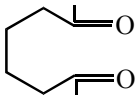
50. 2-pentanone and 3-pentanone are
a) chain isomers b) position isomers
c) metamers d) functional isomerism

51. Ketone never show
a) chain isomerism b) position isomerism
c) both a and b d) optical isomerism

52. In > C = O group sigma bond is formed by
a) sp^2-p-overlapping b) sp^3-p-overlapping
c) sp-p-overlapping d) s-p-overlapping

53. The π-bond in carbonyl group is formed by
a) s-s-overlapping b) p-p-overlapping
c) s-p-overlapping d) p-d-overlapping

54. IUPAC name of following compound is



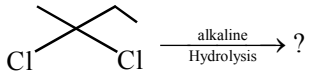
a) heptane 2,6-dione b) octan-6-one
c) octane 2,7-dione d) hexane-2,5-dione

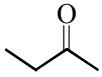
55. Butanone and butanal are
a) chain isomers b) position isomers
c) functional isomers d) tautomers

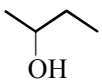
56. Metamerism is present in
a) $CH_3–O–CH_3$ b) CH–CO–CH
c) $CH_3–CO–C_2H_5$ d) $CH_3–CO–C_3H_7$

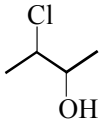
Preparation Methods

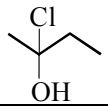
57. Product of folio wing reaction is



a) 

b) 

c) 

d) 

58. Calcium formate, on dry heating, produces
a) acetone b) acetic acid
c) acetaldehyde d) formaldehyde

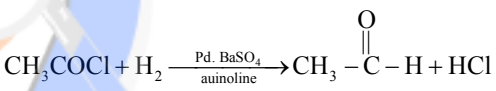
59. The reaction of RON with RMgX followed by hydrolysis gives
a) an aldehydes b) an ketones
c) 2^0 alcohols d) 3^0 alcohols

60. An isomer of $C_3H_6Cl_2$ on boiling with aq. KOH give acetone. Hence, the isomer is,
a) 2, 2-dichloro propane
b) 1, 2-dichloro propane
c) 1, 1-dichloro propane
d) 1, 3-dichloro propane

61. 2, 2-dichloro butane on boiling with aq. potash gives
a) butanal b) 2-butanone
c) 2-butanol d) butanoic acid

62. Propanone can be obtained from oxidation of what?
a) 2-propanol b) 1-propanol
c) 2-butanol d) 2methyl,l-butanol

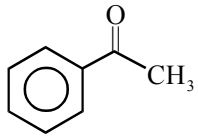
63. The reaction

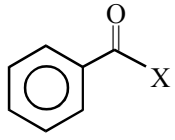


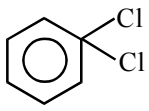
is called
a) Cannizzaro's reaction
b) Stephen's reduction
c) Haloform reaction
d) Rosenmund's reduction

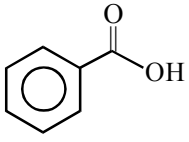
64. Rosenmund's reduction is used to prepare
a) alcohol b) carboxylic acid
c) aldehyde d) Ketones

65. Benzaldehyde is obtained from Rosenmund's reducation of

a) 

b) 

c) 

d) 

66. 1,1-dichlorocyclohexane on alkaline hydrolysis gives

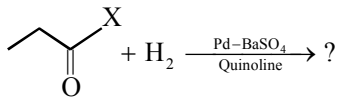
a) cyclohexane carbaldehyde

b) cyclohexanone

c) benzophenone

d) cyclohexane carboxylic acid

67. Product of the following reaction is



a) propanone b) propanal

c) propionic acid d) propane

68. Rosenmund's reduction convert

a) carboxylic acid to aldehyde

b) ketone to 2.-alcohol

c) acyl halide to ketone

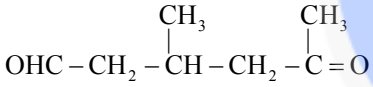
d) acyl halide to aldehyde

69. An optical active alcohol of formula $C_4H_{10}O$ on oxidation gives which of the following compound?

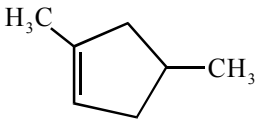
a) $(CH_3)_2CHCHO$ b) $(CH_3)_2C = CH_2$

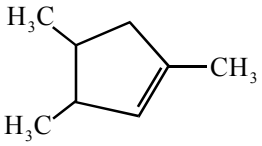
c) $CH_3COC_2H_5$ d) $CH_3CH_2CH_2CHO$

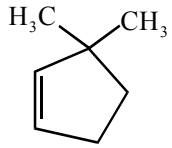
70. A single compound of the structure is obtainable

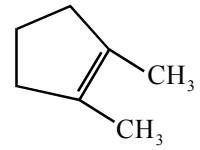


from ozonolysis of which of the following cyclic compounds?

a) 

b) 

c) 

d) 

71. 2-methyl propanal is formed from isopropyl magnesium halide and what ?

a) CH_3CN b) HCHO

c) HCN d) CH_3COCH_3

72. Calcium acetate on heating gives

a) acetone b) formic acid

c) acetal dehyde d) methane

73. Which of the following is Collin's reagent ?

a) pyridine

b) chromium oxide

c) pyridinium chlorochromate

d) $KOH + KMnO_4$

74. Dry distillation of a mixture of calcium acetate and calcium formate can form

a) formaldehyde b) acetaldehyde

c) acetone d) all of these

75. Which of the following is not used in the preparation of ketone ?

a) Oxidation of secondary alcohols

b) Dehydrogenation of 2^0 alcohol

c) Pyrolysis of calcium acetate

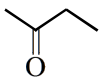
d) Acid hydrolysis of alkyl cyanide

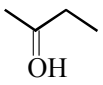
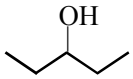
76. Which of the following compounds is oxidised to prepare ethyl methyl ketone ?

a) 1-butanol b) t-butyl alcohol

c) 2-butanol d) 2-propanol

77. Product formed when but-1-yne is reacted with dil.H_2SO_4 and $HgSO_4$

a)  b) 

c)  d) 

78. Isopropyl alcohol On oxidation forms

a) acetone b) ether

c) acetaldehyde d) ester

79. Ethylidence chloride on hydrolysis with aq.NaOH gives

a) CH_3CHO b) $CH_3COC_2H_5$

c) C_2H_5OH d) $CH_3CH(OH)_2$

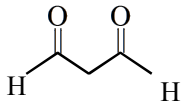
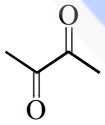
80. Acetone is prepared by
a) oxidation of acetic acid
b) pyrolysis of acetic acid
c) pyrolysis of calcium acetate
d) oxidation of n-propyl alcohol

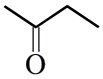
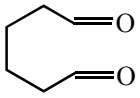
81. Formation of acetaldehyde from ethanol is known as
a) oxidation b) substitution
c) addition d) reduction

82. Ketones can be obtained in one step by
a) hydrolysis of esters
b) oxidation of primary alcohols
c) oxidation of secondary alcohols
d) reaction of acid unhydride and alcohol.

83. 2-butanone can be obtained by heating a mixture of calcium salt of
a) formic acid and butyric acid
b) propionic acid and formic acid
c) propionic acid and acetic acid
d) acetic acid and formic acid

84. Ozonolysis following compound in the presence of Zn gives

a)  b) 

c)  d) 

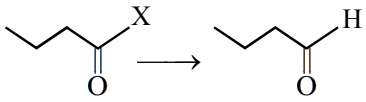
85. On heating calcium acetate and calcium formate, the product formed is
a) CH_3COCH_3 b) CH_3CHO
c) $HCHO + CaCO_3$ d) $CH_3CHO + CaCO_3$

86. Which of the following compound gives a ketone with Grignard reagent ?
a) Formaldehyde b) Ethyl alcohol
c) Methyl cyanide d) Methyl iodide

87. Which one is not synthesized by Grignard reagent?
a) Primary alcohol b) Secondary alcohol
c) A ketone d) An ester

88. Ethylidene chloride on treatment with aqueous KOH gives?
a) Acetaldehyde b) Ethylene glycol
c) Formaldehyde d) None

89. Find out reducing agent in following conversion.



a) $Na.Hg + H_2O$
b) $H_2 + Ni$
c) $Pd.BaSO_4$ + quirioline
d) $SnCl_2 + HC1$

90. Which poison the catalyst (Pd) at aldehyde stage in the reduction of acyl halide
a) PCC b) $BaSG_4$
c) $SnCl_2$ d) $CuSO_4$

91. Cyclohexanoyl chloride on reduction by poisoned catalyst gives
a) benzaldehyde b) cyclohexanol
c) cyclohexanone d) cyclohexyl methanal

92. Stephen's reduction convert
a) acyl chloride to aldehyde
b) cyanide to aldehyde
c) cyanide to carboxylic acid
d) cyanide to ketones

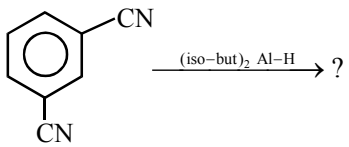
93. The reaction

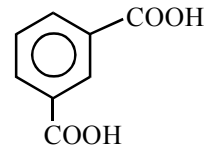
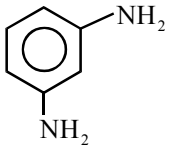
$$R-C\equiv N \xrightarrow[H_2O^+]{SnCl_2+HCl} R-CHO + NH_3$$

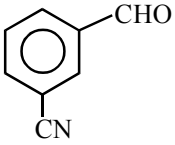
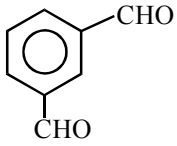
a) Rosenumund's reduction
b) Stephen's reducation
c) Clemmenson's reducation
d) Cannizzaro's reaction

94. Formonitrile is reduced by $SnCl_2$ + HC1 and product on acid hydrolysis gives
a) formic acid b) methanal
c) acetic acid d) acetone

95. Product of the following reaction is



a)  b) 

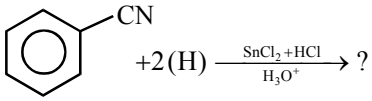
c)  d) 

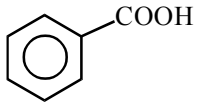
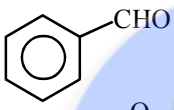
96. Rosenmund's reduction carried out by using

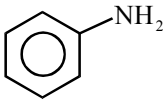
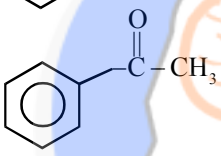
a) H_2/Ni b) Na.Hg + H_2O

c) $LiAlH_4$ d) Pd-$BaSO_4$ + quinoline

97. Product of the following reaction is



a)  b) 

c)  d) 

98. Conversion of ester to aldehyde which of the following reagent is used ?

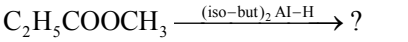
a) $SnCl_2$ + HC1

b) Pd.$BaSO_4$ + quinoline

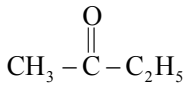
c) Cr_2O_3

d) $(isobut)_2Al–H$

99. The product of following reaction is



a) $CH_3–CHO$ b) C_2H_6CHO

c)  d) $C_2H_5–COOH$

100. Compound A is reacted with KCN and followed by reduction using $SnCl_2$ + HC1 and successive hydrolysis gives propanal. The compound A is

a) $C_2H_5–X$

b) $C_2H_5–OH$

c) $CH_3–CH_2–CH_2–X$

d) $C_2H_5–CN$

101. Acetaldehyde is

a) oxidising agent

b) reducing agent

c) both oxidising and reducing agent

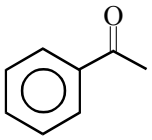
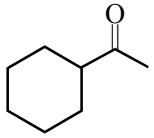
d) none of these

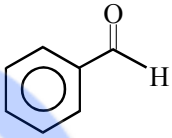
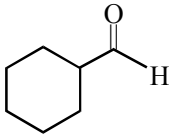
102. Ethyl cyanide is reduced by di-isobutyl aluminium hydride gives

a) propanal b) propanoic acid

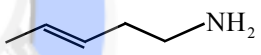
c) propan-1-amine d) propane

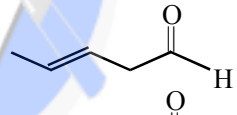
103. Methyl benzoate is reduced by di-isobut aluminium hydride gives

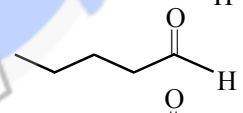
a)  b) 

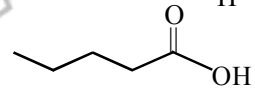
c)  d) 

104. Pent-3-ene-l-nitrile on reduction by di-isobutyl aluminium hydride gives

a) 

b) 

c) 

d) 

105. Etard oxidation convert toluene to

a) benzoic acid b) acetophenone

c) benzaldehyde d) benzoyl chloride

106. Oxidising agent in Etard oxidation is

a) $K_2Cr_2O_2$ + dil.H_2SO_4

b) KOH + $KMNO_4$

c) dil.HNO_3

d) CrO_2Cl_2 in CS_2

107. Oxidation of toluene by chromium oxide in acetic anhydride gives

a) benzaldehyde b) benzoic acid

c) benzophenone d) acetophenone

108. p-nitro toluene convert p-nitro benzaldehyde by using

a) $KOH + KMnO_4$ b) CrO_3 in $(CH_3CO)_2O$

c) $SnCl_2 + HC1$ d) $Pd\text{-}BaSO_4$ + guinoline

109. Find out B in the reaction

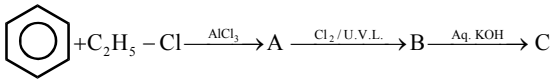
a) Acetophenone

b) benzaldehyde

c) cyclohexyl carbaldehyde

d) benzoic acid

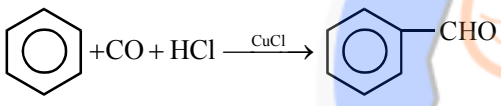
110. Find out C in the following reaction



a) benzaldehyde b) l-phenyl ethanal

c) Acetophenone d) benzophenone

111. The reaction



a) Rosenmund's reaction

b) Stephen's reaction

c) Cannizzaro's reaction

d) Gatterman-koch reaction

112. Tbluene is subjected to Gatterman-Koch reaction produces

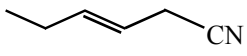
a) benzaldehyde

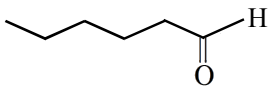
b) benzoic acid

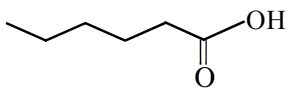
c) 2-methyl benzaldehyde

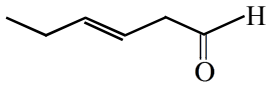
d) acetophenone

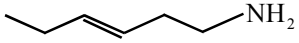
113. Following compound on reducation by using $(iso\text{-}but)_2Al\text{-}H$ gives



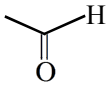
a) 

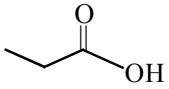
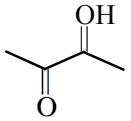
b) 

c) 

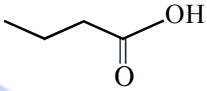
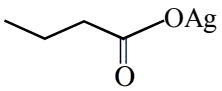
d) 

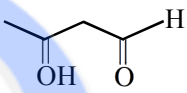
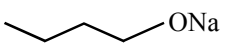
114. Ethyl acetate is reduced by di-isobutyl aluminium hydride gives

a)  b) 

c)  d) 

115. Compound A is reacted with C_2H_5–X gives B. The compound B is reduced by di-isobutyl aluminium hydride gives butanal. The compound A is

a)  b) 

c)  d) 

116. Benzal chloride on hydrolysis gives

a) benzole acid b) benzaldehyde

c) benzo chlorid d) benzyl cholride

117. Toluene on side chain chlorination and following by hydrolysis gives

a) Tolyl chloride b) benzaldehyde

c) p-chloro toluene d) acetophenone

118. Side chain chlorination of ajkyl benzene followed by hydrolysis gives

a) aromatic aldehyde

b) aromatic ketones

c) aromatic carboxylic acid

d) both a and b

Properties and Uses

119. A reagent which reacts differently with CH_2O, C_2H_4O, C_3H_6O is

a) NH_2OH b) $C_6H_5NHNH_2$

c) HCN d) NH_3

120. Which of the following has maximum reactivity towards HCN ?

a) HCHO

b) CH_3CHO

c) CH_3COCH_3

d) $CH_3COC_2H_5$

121. Consider the following substances

1. HCHO 2. CH_3CHO
3. CH_3COCH_3 4. $CH_3COC_2H_5$

The correct order of reactivity towards nucleophilic addition reaction is

a) 1 > 2 > 3 > 4 b) 1 > 3 > 2 > 4
c) 1 > 2 > 4 > 3 d) 1 > 4 > 2 > 3

122. The reagent with which both acetaldehyde and ketone react easily is

a) Fehling solution
b) Grignard's reagent
c) Schiffs reagent
d) Tollen's reagent

123. Inpresence of conc. alkali formaldehyde undergoes

a) Aldol condensation b) Cannizzaro's reaction
c) Esterification d) Wurtz reaction

124. The Cannizzare's reaction is not given by

a) benzaldehyde b) chloral
c) methanal d) ethanal

125. Treatment of butanal with dilute NaOH solution gives

a) $CH_3CH_2CH_2COOCH_2CH_2CH_2CH_3$
b) $CH_3CH_2CH_2CHOHCH_2CH_2CH_2CHO$
c) $CH_3CH_2CH_2CHOHCH(C_2H_5)CHO$
d) $CH_3CH_2CH_2COCH_2CH_2CH_2CHO$

126. The products of the reaction of two molecules of HCHO with strong potash is

a) CH_3OH and HCOOH
b) CH_3OH and HCOONa
c) CH_3OH and HCOOK
d) C_2H_5OH

127. In the reaction of $NaHSO_3$ with carbonyl compounds to form bisulphite product, the nucleophile is

a) HSO_3^- b) SO_3Na
c) SO_3^- d) none of the above

128. The formation of cyanohydrin from a ketone is an example of

a) electrophilic addition
b) nucleophilic addition
c) electrophilic substitution
d) nucleophilic substitution

129. Acetone on treatment with CH_3MgI on further hydrolysis gives

a) $(CH_3)_2CHCH_2OH$
b) $(CH_3)_3COH$
c) $CH_3CH(OH)CH_2CH_3$
d) $CH_3CH_2CH(OH)CH_2CH_3$

130. Base catalysed aldol condensation occurs with

a) propanal b) butanal
c) ethanal d) all of these

131. Treatment of propanal with dilute NaOH solution gives

a) $CH_3CH_2COOCH_2CH_2CH_3$
b) $CH_3CH_2CHOHCH(CH_3)CHO$
c) $CH_3CH_2CHOHCH_2GH_2CHO$
d) $CH_3CH_2COCH_2CH_2CHO$

132. Ethanal and propanone undergoes aldol condensation reaction inpresence of dilute alkali to form

a) $CH_3C(OH)(CH_3)CH_2CHO$
b) $CH_3CH(OH)CH_2COCH_3$
c) $CH_3COC(OH)(CH_3)_2$
d) $CH_3COCH(CH_3)CH_2OH$

133. Iodoform test is not given by

a) ethanol b) ethanal
c) acetone d) 3-pentanone

134. Methyl ketones are usually characterised through

a) the Tollen's reagent
b) the Schiffs reagent
c) the iodoform test
d) Cannizzaro's reaction

135. Grignards reagent adds to

a) >C = 0 b) >C = S
c) –C = N d) all of the above

136. An organic compound of formula, C_3H_6O forms phenyl hydrazone, but gives negative Tollen's test. The compound is

a) $CH_2 = CHOCH_3$
b) CH_3CH_2CHO
c) CH_3COCH_3
d) $CH_2 = CHCH_2OH$

137. Which does not react with Fehling solution ?

a) Ethanal b) Glucose
c) Formic acid d) Benzaldehyde

138. The reaction of RMgX with a ketone, followed by treatment with H_3O^+ forms
a) 1^0 alcohol b) 2^0 alcohol
c) 3^0 alcohol d) alkane.

139. When acetone is heated with ammonia gives diacetone amine, the intermediate compound formed in this reaction is,
a) $(CH_3)_2C = CHCOCH_3$
b) $CH_3CH_2CH = CH_2COCH_3$
c) $(CH_3)_2C = CHCH_2CHO$
d) $(CH_3)_2C = CH_2CH_2COCH_3$

140. > C = O is converted into – CH_2– by
a) Clemmenson reduction
b) H_2/Ni
c) Mendius reduction
d) NaHg + H_2O reaction.

141. Which of the following give self redox reaction?
a) Methanal b) Ethanal
c) Butanal d) Methanol

142. Which of the following reagent react with CH_2O forming urotropine ?
a) NH_2OH b) NH_3
c) HCN d) RMgX

143. Propanal and propanone undergoes condensation reaction in presence of dil.KOH to form,
a) $CH_3CH_2CH(OH)CH_2COCH_3$
b) $CH_3C(OH)(CH_3)CH(CH_3)CHO$
c) $CH_3CH(OH)(CH_3)CH_2CH_2CHO$
d) none of these

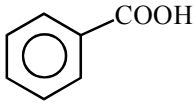
144. Which one of the following reaction yield diacetone alcohol from carbonyl compound?
a) Cannizzaro's reaction
b) Catalytic hydrogenation
c) Aldol condensation
d) Oxidation

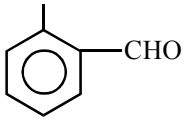
145. When H-CHO reacts with NHj, urotropin is formed. In this molecule how many C–C bonds are present?
a) 4 b) 2
c) 0 d) 6

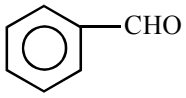
146. Acetone shows similarity with acetaldehyde in reacting to
a) Tollen's reagent b) Schiffs reagent
c) Fehling solution d) Grignard reagent

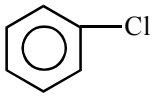
147. Cyanohydrine of the following compound on hydrolysis give optically active compound.
a) CH_3–$COCH_3$ b) H–CHO
c) CH_3– CHO d) All of these

148. When ethanal is heated with Fehling's solution, it gives a precipitate of
a) Cu b) CuO
c) Cu_2O d) Cu_2O + CuO

149. Benzene is reacted with carbon monoxide in HC1 in the presence of catalyst, cupric chloride gives
a) 

b) 

c) 

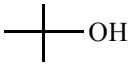
d) 

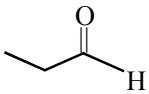
150. Which of the following is used to prepare ketone from acyl chloride
a) R–MgX b) R_2Cd
c) CO + HC1 d) CrO_3

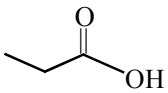
151. Dimethyl cadmium and acetyl chloride produces
a) acetone
b) t-butyl alcohol
c) 2^0-propyl alcohol
d) n-propyl alcohol

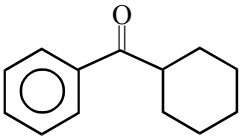
152. Product of the following reaction is

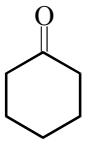
$$CH_3COCl + CH_3MgX \xrightarrow[H_3O^+]{\text{dry ether}}$$

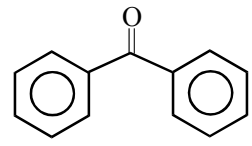
a) 
b) 

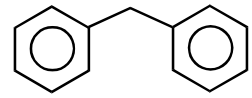
c) 

d) 

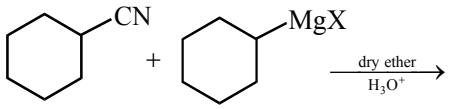
153. Benzonitrile and phenyl magnesium bromide produces
a) 

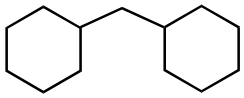
b) 

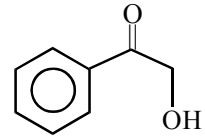
c) 

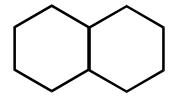
d) 

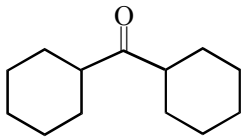
154. Product of the following reaction is



a) 

b) 

c) 

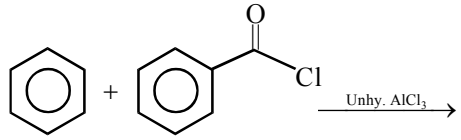
d) 

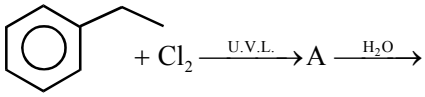
155. Friedel Craft acetylation of benzene gives

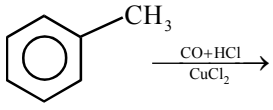
a) benzophenone b) acetophenone

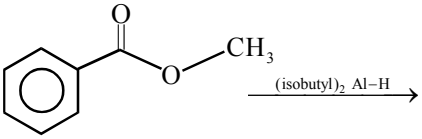
c) alkyl benzene d) di phenyl

156. Diphenyl methanone is obtained from

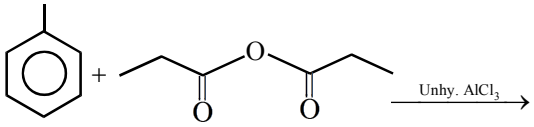
a) 

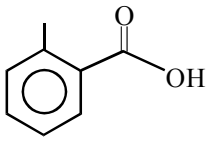
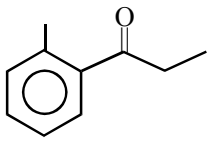
b) 

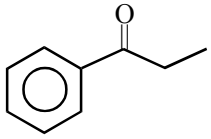
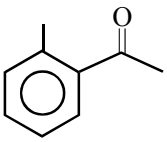
c) 

d) 

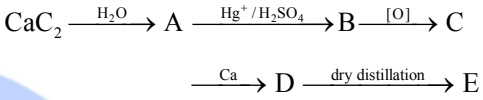
157. Product of the following reaction is



a)  b) 

c)  d) 

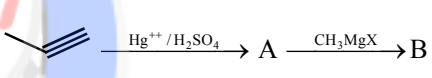
158. In the following sequence of reaction end product is.

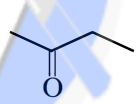
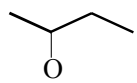


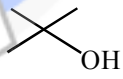
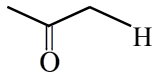
a) acetaldehyde b) propanone

c) methanal d) ethanoic acid

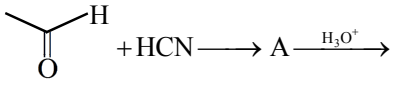
159. In the following sequence of reaction end product is

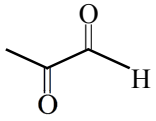
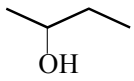


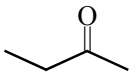
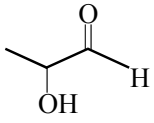
a)  b) 

c)  d) 

160. The product 'B' in the following reaction.



a)  b) 

c)  d) 

161. The correct order of solubility of following compound is

1. H–CHO 2. CH_3–CHO
3. CH_3–CH_2–CHO 4. CH_3–$COCH_3$

a) 4 > 3 > 2 > 1 b) 1 > 2 > 4 > 3

c) 1 > 2 > 3 > 4 d) 1 > 4 > 2 > 3

162. Acetylene on hydration gives compound A, which on Clemmenson's reduction gives ?
a) Ethane b) Ethyl alcohol
c) Acetaldehyde d) Ethene

163. Compound 'A' has molecular formula $C_5H_{10}O$ reduce Tollen's reagent on oxidation gives monocarboxylic acid with same number of carbon atoms. The compound A' is
a) $CH_3COCH(CH_3)_2$ b) $CH_3(CH_2)_3–CHO$
c) $C_2H_5COC_2H_5$ d) $CH_3COCH_2CH_2CH_3$

164. Wolf-Kishner reduction is
a) reduction of carbonyl compound in to alcohol
b) reduction of carbonyl compound in to alkene
c) reduction of carboxyl compound in to alkane
d) reduction of nitro compound into aniline

165. Among the following compound the reactivity order is
1. H–CHO 2. $CH_3–CHO$
3. $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$ 4. $C_2H_5–COCH_3$
a) 1 > 2 > 4 > 3 b) 4 > 3 > 2 > 1
c) 1 > 2 > 3 > 4 d) 1 > 3 > 4 > 2

166. Less reactivity of ketone is due to
a) +1 inductive effect decrease positive charge on carbonyl carbon atom
b) steric effect of two bulky alkyl groups
c) sp^2 hybridised carbon atom of carbonyl carbon atom
d) both a and b

167. To distinguish between acetone and iso-propyl alcohol, which of the following reagent can help
a) NaCl b) NaOH
c) Na_2CO_3 d) $NaHSO_3$

168. Which of the following statement is wrong?
a) aldehyde and ketones are reducing agents
b) aldehyde and ketones are nonpolar compounds
c) aldehydes are more reactive than ketones
d) aldehydes and ketones are reduced to alcohol

169. Which of the following statement is correct regarding the aldol condensation?
a) All aldehydes give this reaction
b) Ketones do not give this reaction
c) This reaction proceeds in presence of strong alkali
d) Ketones, in which α-hydrogen atom is present, give this reaction

170. If formaldehyde and KOH are heated then we get
a) methane b) acetylene
c) ethyl formate d) methyl alcohol

171. Benzaldehyde is converted to benzyl alcohol by
a) Wurtz reaction
b) Fitting reaction
c) Wurtz fittings reaction
d) Cannizzaro's reaction

172. Aldehydes are oxidised to acids by
a) potassium dichromate
b) Tollen's reagent
c) Fehling's solution
d) all of these

173. Formaldehyde + ammoniac → Y the product Y is
a) methanol
b) formamide
c) para-formaldehyde
d) hexamethylene tetraamine

174. Acetaldehyde and acetone can be identified by
a) Schiff s test b) Lucas test
c) Iodoform test d) Bromoform test

175. Ethanal reacts with alkali to give 3-hydroxy butanal. The reaction is
a) Aldol condensation
b) Claisen condensation
c) Cannizzaro's reaction
d) Clemmenson reduction

176. Which of the following undergoes haloform reaction ?
a) HCHO b) $(CH_3)_2CO$
c) C_2H_5C1 d) $CH_3–O–CH_3$

177. Which of the following cation is involved in Tollens reagent ?
a) $[Ag(NH_3)_2]^+$ b) $2OH^-$
c) $[Ag(NH_3)_3]^+$ d) $AgNO_3$

178. Diethyl ketone and a dimethyl ketone can be distinguished with
a) Tollen's reagent b) Fehling's solution
c) Schiffs reagent d) Haloform test

179. Tollen's reagent is
a) ammonical $CuSO_4$
b) ammonical $AgNO_3$
c) alkaline solution containing complex of copper nitrate.
d) none of these

180. Reduction of a keto group to a methylene group is converted by using
a) ZnHg + conc. HC1
b) NaHg + water
c) Sn + conc. HC1
d) Zn + CH_3COOH

181. Which statement is false regarding acetaldehyde and acetone ?
a) Both reduce ammonical silver nitrate to silver mirror
b) Both react with hydroxylamine to form oximes
c) Both react with hydrazine to form hydrazone
d) Both react with sodium bisulphite to form addition product

182. Which of following give haloform test?
a) CH_3–CHO b) C_2H_5–CHO
c) H–CHO d) C_2H_5–CO–C_2H_5

183. Which of the following compounds does not contain an – OH group?
a) Alcohol b) Phenol
c) Aldehyde d) Carboxylic acid

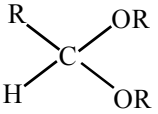
184. HCHO and CH_3CHO differ from each other towards
a) Schiffs reagent b) Fehling solution
c) ammonia d) ammonical $AgNO_3$

185. The most active carbonyl compound is
a) HCHO b) CH_3CHO
c) CH_3COCH_3 d) C_2H_5CHO

186. Out of
1. butane 2. butan-1-ol
3. butanal 4. butanone
The decreasing order of their B.P is
a) 1 > 2 > 3 > 4 b) 2 > 4 > 3 > 1
c) 2 > 3 > 4 > 1 d) 4 > 2 > 3 > 1

187. Acetone is converted into propane by Wolff-Kishner reduction by using reagent
a) $LiAlH_4$ b) Zn.Hg + conc. HCl
c) H_2 + pd-$BaSO_4$ d) NH_2–NH_2 and KOH

188. A neutral compound $C_4H_8O_2$, reduce Fehling's solution, and liberate H_2 gas when treated with sodium metal and give positive iodoform test. The compound is
a) CH_3–CHOHCH_2–CHO
b) HO–CH_2–CH_2–CHO
c) CH_3–CO–CH_2–CHO
d) CH_3COCH_2–CH_2–OH

189. Compound of general formula  are called
a) diester b) acidlinhydride
c) hemiacetal d) acetal

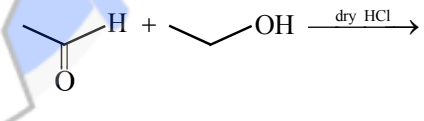
190. In the reaction

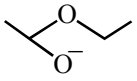
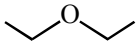
$$CH_3CH=O + A \xrightarrow{\text{dry HCl}} CH_3CH(OC_2H_5)_2 + H_2O$$

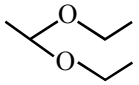
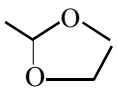
The compound A is
a) propan-1-ol b) ethanol
c) methanol d) C_2H_5–O–C_2H_5

191. During reduction of aldehyde with hydrazine and KOH, the first is the formation of
a) R – CH = NH b) R – CH = N – NH_2
c) $RCONH_2$ d) R – C = N

192. Product of following reaction will be



a)  b) 

c)  d) 

193. Compound of general formula are called
a) acetal b) hemiketal
c) ketal d) hemiacetal

194. Acetals are
a) aldehyde b) ketones
c) ethers d) diether

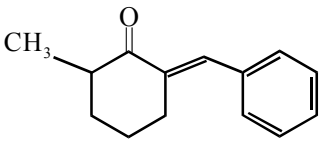
195. Pentan-3-en-2-one is reduced by LiAlH4 gives
a) pent-4-en-2-ol b) pent-3-en-l-ol
c) pent-2-ol d) pent-3-en-2-ol

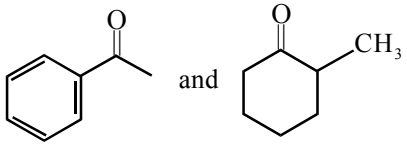
196. Which is best solvent?

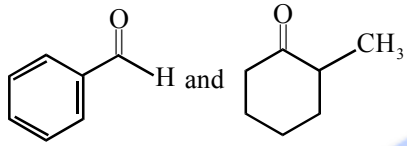
a) H–CHO b) CH_3COCH_3

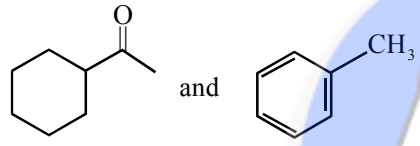
c) $CH_3 - CHO$ d) CH_3COOH

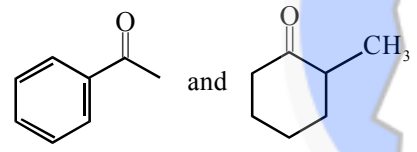
197. What is the structure of carbonyl compounds that will give following compound ?



a) 

b) 

c) 

d) 

198. Prop 1,3-diphenyl 2-en-l-one is crossed condensation product. Which is obtained from

a) benzophenone

b) Acetophenone

c) benzaldehyde

d) Acetophenone and benzaldehyde

199. In mechanism of aldol condensation reaction the second step is

a) abstraction of α-H atom carbon of aldehyde by base to form carbanion

b) The attack of carbanion on carbonyl carbon atom of another molecule to form alkoxide ion

c) The attack of carbanion on carbonyl carbon atom of another molecule to form oxocation

d) Alkoxide ion take proton from water to form β-hydroxy aldehyde

200. Formaldehyde is used as

a) solvent

b) antiseptic

c) disinfectant

d) disinfectant and preservative

201. Carbonyl group in aromatic aldehyde and ketone is

a) o-directing b) p-directing

c) o-and p-directing d) m-directing

202. Benzaldehyde on nitration gives

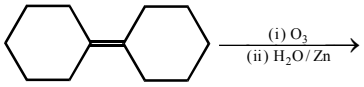
a) o-nitrobenzaldehyde

b) p-nitrobtiizaldehyde

c) mixture of 'a' and 'b'

d) m-nitrobenzaldehyde

203. Product of the following reaction will be



a) cyclohexanal

b) cyclohexanone

c) cyclohexane carbaldehyde

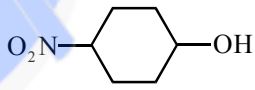
d) cyclohexane carboxylic acid

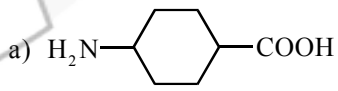
204. But-2-en-l-ol on oxidation by using PCC gives

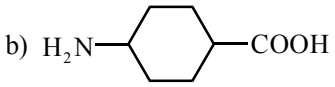
a) Butan-1-ol b) butanal

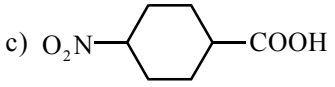
c) but-2-en-al d) butan-2-one

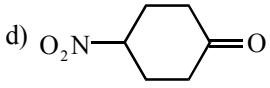
205. Following compound on oxidation by dil.H_2SO_4 gives



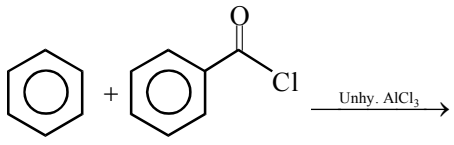
a) 

b) 

c) 

d) 

206. Product of the following reaction is



a) acetophenone

b) diphenyl methanone

c) 2-diphenyl cthanone

d) 1-phenyl ethanone

207. Methyl ketone group is identified by

a) Lucas test b) Haloform test

c) Hinsberg test d) Millon's test

208. Match the list-I and II and select the correct answer

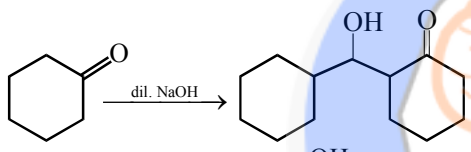
	List-I		**List-II**
1.	Cannizzaro's reaction	a)	$SnCl_2 + HCl$
2.	Stephen's reaction	b)	50%NaOH
3.	Clemmenson reduction	c)	Pd-$BaSO_4$ + quinoline
4.	Rosenmund's reduction	d)	Zn. Hg + Conc. HC1

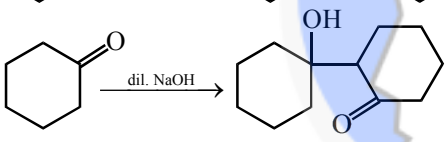
a) 1-b, 2-d, 3-a, 4-c b) 1-b, 2-c, 3-d, 4-a

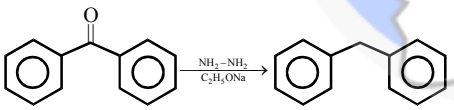
c) 1-b, 2-a, 3-d, 4-c d) 1-d, 2-a, 3-c, 4-b

209. Which of the following is not correct reaction?

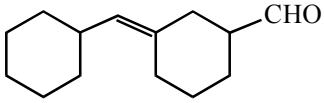
a) $6H-CHO + 4NH_3 \longrightarrow (CH_2)_6N_4 + 6H_2O$

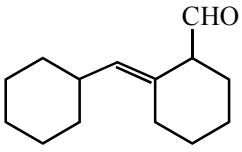
b) 

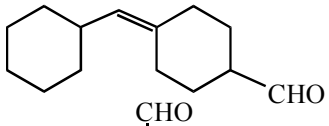
c) 

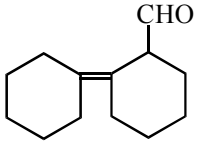
d) 

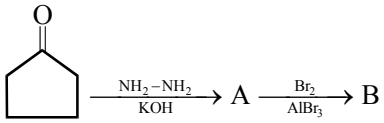
210. What is product formed when cyclohexane carbaldehyde undergoes aldol condensation followed by heating.

a) 

b) 

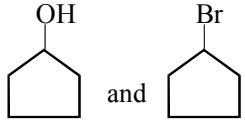
c) 

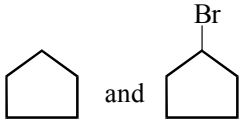
d) 

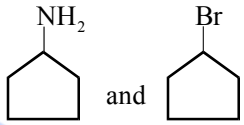
211. 

The product A and B are

a) 

b) 

c) 

d) 

212. A carbonyl compound 'A' react with hydrogen cyanide to give cyanohydrin 'B' which on acid hydrolysis gives, optically active β-hydroxy propanoic acid 'C' Compounds A, B, C respectively are

a) $HCHO, H-\underset{\underset{CN}{|}}{\overset{\overset{H}{|}}{C}}-OH, H-\underset{\underset{COOH}{|}}{\overset{\overset{H}{|}}{C}}-OH$

b) $CH_3-CHO, CH_3-\underset{\underset{CN}{|}}{\overset{\overset{H}{|}}{C}}-OH, CH_3-\underset{\underset{COOH}{|}}{\overset{\overset{H}{|}}{C}}-OH$

c) $C_2H_5-CHO, C_2H_5-\underset{\underset{CN}{|}}{\overset{\overset{H}{|}}{C}}-OH, C_2H_5-\underset{\underset{COOH}{|}}{\overset{\overset{H}{|}}{C}}-OH$

d) $CH_3-\overset{\overset{CH_3}{|}}{C}=O, CH_3-\underset{\underset{CN}{|}}{\overset{\overset{CH_3}{|}}{C}}-OH, CH_3-\underset{\underset{COOH}{|}}{\overset{\overset{CH_3}{|}}{C}}-OH$

213. Which of the following alkane cannot be prepared by Clemmenson's reduction of ketones?

Acetone + A → Oxime of acetone

Acetone + B → propane

Acetone + C → Pinacol

A, B and C are

a) NH_2–OH, Mg, Zn.Hg + conc. HCl
b) NH_2–OH, Zn.Hg + conc. HCL, Mg
c) Mg, NH_2–OH, Zn.Hg + conc. HC
d) NH_2–OH, Na.Hg + H_2O, Mg

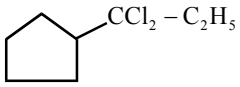
214. $\underset{\underset{COOH}{|}}{CHO} + NaOH \xrightarrow{50\ \%}$ product (s),

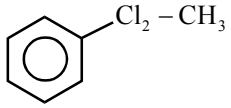
Identify the products

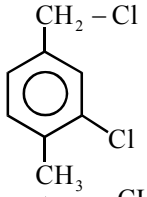
a) $\underset{\underset{COONa}{|}}{COONa}$ b) $\underset{\underset{COONa}{|}}{CH_2-OH}$

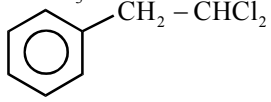
c) both a and b d) $\underset{\underset{COONa}{|}}{CHO}$

215. Structure $C_8H_8Cl_2$ an alkaline hydrolysis gives a product which does not give iodoform test but give silver mirror test, is

a) 

b) 

c) 

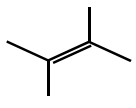
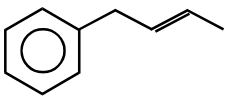
d) 

216. Which of the following reagent to get sp^3-hybridised carbon atom from sp^2-hybridised carbon atorri?

a) NH_2–NH_2 b) NH_2–CO–NH–NH_2
c) NH_2–NH_2/KOH d) NH_2OH

217. An alkene (A) on ozonolysis gives (B) as one of the product, (B) can gives Cannizzaro's reaction. The compound (A) is

a)  b) 

c)  d) 

218. Which of the following alkane cannot be prepared by clemmenson's reducation of ketones?

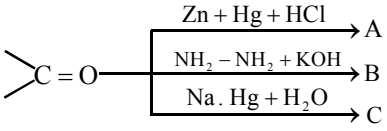
a)  b) 

c)  d) 

219. Reaction of aldehyde with NH_2–OH will be fastest at which of the following P_H

a) 1 b) 6
c) 7 d) 8

220. In the reaction.



a) A = aldehyde, B = ketone, C = alcohol
b) A, B, C are alkene.
c) A, B are alkane and C = alcohol
d) A, B are alkane, C = alkene

221. In Cannizzaro's reaction of formaldehyde involves an

a) Intramolecular shift of proton
b) Intramolecular shift of hydride
c) Intermolecular shift of proton
d) Intermolecular shift of hydride

222. Consider two aldehydes

1. CH_3-CHO 2. H–CHO

The correct statement is/are

a) both undergoes aldol condensation
b) both do not undergoes aldol condensation
c) only (1) undergoes aldol condensation
d) only (2) undergoes aldol condensation

223. Final product B in the following sequence of reaction

$$C_6H_5-CH_2OH \xrightarrow[573\ k]{Cu} A \xrightarrow[strong]{NaOH} B + C_6H_5CH_2-OH$$

a) benzaldehyde b) acetophenone
c) sodium phenoxide d) sodium benzoate

224. The final product 'C' in the following reaction.....

$$H-CHO + CH_3-CH_2-CHO \xrightarrow{OH} A \xrightarrow{\Delta/H^+} B \xrightarrow{NaBH_4} C$$

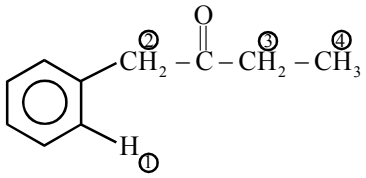
a) $CH_2=\underset{\displaystyle CH_3}{\overset{|}{C}}-CHO$

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

c) $CH_2=\underset{\displaystyle CH_3}{\overset{|}{C}}-CH_2-OH$

d) $CH_2=CH-CH_2-CH_2-OH$

225. Which of the following four hydrogens is most acidic ?



a) 1 b) 2

c) 3 d) 4

226. Find out A, B, C, D in following reaction

1. $CH_3-CH=CH-CHO \xrightarrow{A} CH_3-CH=CH-COOH$
2. $CH_3-CH=CH-CHO \xrightarrow{B} CH_3-CH=CH-CH_2-OH$
3. $R-COOH \xrightarrow{C} R-CH_2-OH$
4. $R-COCl \xrightarrow{D} R-CHO$

a) 1 = H_2.pd.$BaSO_4$, 2 = Ammonical $AgNO_3$ 3 = $LiAlH_4$, 4 = $LiAlH_4$

b) 1 = $LiAlH_4$, 2 = $LiAlH_4$, 3 = H_2.Pd.$BaSO_4$, 4 = Ammoniacal AgNO

c) 1 = Ammonical $AgNO_3$, 2 = $LiAlH_4$, 3 = $LiAlH_4$, 4 = $H_2Pd + BaSO_4$

d) 1 = LiAlH4, 2 = $LiAlH_4$, 3 = Ammoniacal $AgNO_3$, 4 = $H_2Pd + BaSO_4$

227. Which among the following is most reactive in nucleophilic addition ?

a) FCH_2-CHO b) $C1-CH_2CHO$

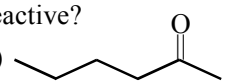
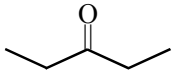
c) $Br-CH_2-CHO$ d) $I-CH_2-CHO$

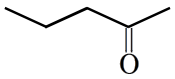
228. Which of the following carbonyl compound is most polar?

a) $CH_3COC_2H_5$ b) CH_3COCH_3

c) CH_3CHO d) H – CHO

229. Which of the following isomeric compound is most reactive?

a)  b) 

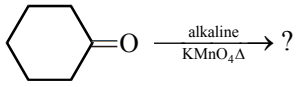
c)  d) all are equally reactive

230. The reagent which oxidise aldehyde and ketone is

a) Tollen's reagent b) Fehling's solution

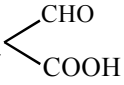
c) Schiffs reagent d) $K_2Cr_2O_7 + H_2SO_4$

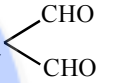
231. The product of given reaction is



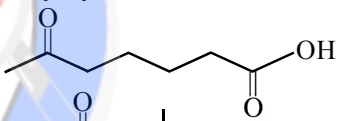
a) $CH_2=CH(CH_2)_3-COOH$

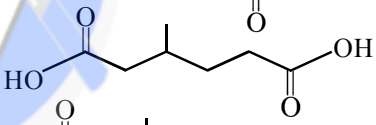
b) $CH_3-(CH_2)_4-COOH$

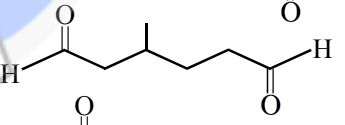
c) $(CH_2)_4$ 

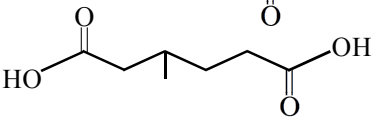
d) $(CH_2)_4$ 

232. 3-methyl cylohexene on oxidation will give

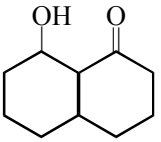
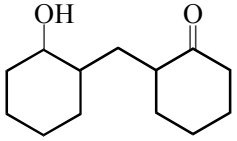
a) 

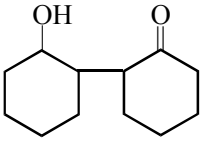
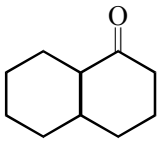
b) 

c) 

d) 

233. Cyclohexanone is treated with $Ba(OH)_2$ gives

a)  b) 

c)  d) 

234. Mixture of ethanal and propanal is subjected to aldol condensation, the product formed are

a) 1 b) 2

c) 3 d) 4

235. Aldehyde which shows Cannizzaro's reaction is

a) H–CHO b) C_6H_5–CHO

c) CCl_3 – CHO d) all of these

236. The aldehyde having α-H atom gives Cannizzaro's reaction is

a) CH_3–CH_2–CHO

b) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CHO$

c) CH_3–CH_2–CH_2–CHO

d) $CH_3-\underset{\displaystyle Cl}{\underset{|}{CH}}-CHO$

237. Mixture cf H–CHO and C_6H_5–CHO is treated with cone. NaOH then self redox reaction involves

1. oxidation of H–CHO
2. oxidation of C_6H_5–CHO
3. reduction of H–CHO
4. reduction of C_6H_5–CHO

a) 1, 3 b) 1, 2

c) 1, 4 d) 2, 3

238. When ethanoyl chloride is reduced with hydrogen using Pd deposited over $BaSO_4$ catalyst it forms

a) ethane b) chloroethane

c) ethanal d) ethanol

239. Crotonaldehyde is easily oxidised to crotonic acid using

a) alkaline $KMnO_4$ b) Tollen's reagent

c) acidic $KMnO_4$ d) CrO_3

240. Which of the following aldehyde forms stable hydrate?

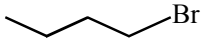
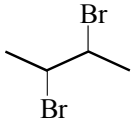
a) Trichloroacetaldehyde

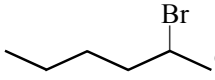
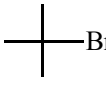
b) acetaldehyde

c) fomaldehyde

d) propanal

241. An unknown alkyl halide 'A' reacts with alcoholic KOH to produce C_4H_8. Ozonolysis of the hydrocarbon gives one mole of propanal and one mole of methanal the correct structure of 'A' is

a)  b) 

c)  d) 

242. $(CH_3)_2C = CHCOCH_3$ can be oxidised to $(CH_3)_2C = CH–COONa$ by

a) NaOH + KOH b) NaOH

c) NaOI d) $KMnO_4/H^+$

243. For the following conversion which can be used

$$R_2C=O \longrightarrow R_2CH_2$$

a) Clammenson's reaction

b) Wolff Kishner reaction

c) Zn + conc. HC1

d) both 'a' and 'b'

244. Benzaldehyde can be prepared by hydrolysis of

a) Benzyl chloride b) Benzal chloride

c) Benzotrichloride d) benzonitrile

245. 1-phenyl ethan-1-ol is prepared by reaction of benzaldehyde with

a) methyl bromide

b) ethyl magnesium iodide

c) methyl magnesium bromide

d) methyl iodide and zinc metal

246. Oxidation of toluene to benzaldehyde by chromyl chloride is called

a) Rosenmund reaction

b) Wurtz reaction

c) Etard reaction

d) Fitting reaction

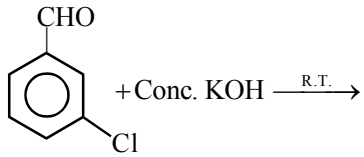
247. Which of the following reagent convert

$$C_6H_5CHO \longrightarrow C_6H_5COOH$$

a) Fehling's solution b) PCC

c) Tollen's reagent d) H_2 + Ni

248. The product of following reaction will be



a) m-hydroxy benzaldehyde

b) potassium m-chlorobenzoate and benzyl alcohol

c) potassium m-chlorobenzoate and m-chlorobenzyl alcohol

d) m-cresol

249. Hydrogenation of benzyol chloride in the presence of Pd on $BaSO_4$ gives
a) benzyl alcohol b) benzoic acid
c) benzaldehyde d) phenol

250. An organic compound does not give a precipitate with 2, 4-DNP and does not react with sodium metal. It could be
a) $CH_3–CH_2–CHO$ b) CH_3COCH_3
c) $CH_3–CHO$ d) $CH_3OC_2H_5$

251. What is 'B' in the following reaction?

$$CH_3-CN \xrightarrow[(ii)\ H_3O^+]{(i)\ SnCl_2+HCl} A \xrightarrow{Na_2CO_3} B$$

a) $CH_3-\underset{\underset{OH}{|}}{CH}-CH_2CH_3$

b) $CH_3-\underset{\underset{OH}{|}}{CH}-CH_2CHO$

c) $CH_3–CH_2–COONa$
d) $CH_3–CH_2–ONa$

252. Under Wolff-Kishner reduction the conversion may be brought about are
a) benzophenone to diphenyl methane
b) benzaldehyde to benzyl alcohol
c) cyclohexanone to cyclohexene
d) cyclohexanone to cyclohexanol

253. When formaldehyde react with ethyl amine, it gives
a) formaldehyde imine
b) formaldehyde ethyl amine
c) dimethyl amine
d) diethylamine

254. Imine derivatives of aldehyde and ketone is called as
a) Schiff s reagent b) Fehling's reagent
c) Schiffs base d) Schiffs acid

255. Acetone on condensation gives
a) mesitylene b) mesityl oxide
c) propanal d) di-isopropyl ether

256. A carbonyl compound with molecular weight 86, does not reduce Fehling's solution, but form crystalline bisulphite derivatives and gives iodoform test. The possible compound can be
a) Pentan-2-one and pentan-3-one
b) Pentan-2-one and 3-methyl butan-2-one
c) Pentanal
d) pent-3-one

257. $CH_3–CH = CH – CHO$ is oxidised to $CH_3 – CH = CH – COOH$ using oxidising agent
a) alkaline $KMnO_4$
b) $K_2Cr_2O_7$ + conc. H_2SO_4
c) dil. HNO_3
d) ammonical $AgNO_3$

258. Ketones $R-\overset{\overset{O}{\|}}{C}-R'$ where R = R¢ alkyl group can be obtained in one step by
a) oxidation of 1^0 alcohol
b) hydrolysis of ester
c) hydrolysis of acid anhydride
d) oxidation of 3^0 alcohol

259. Among the given compound the most susceptible to nucleophilic attack at carbonyl group is
a) HCHO b) MeCOOMe
c) MeCHO d) MeCOO COme

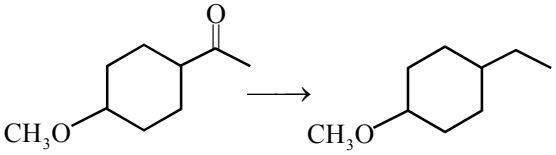
260. The reaction given below is

$$2H-CHO \xrightarrow{OH^-} H-COONa + CH_3OH$$

The slowest step is
a) Wurtz's reaction b) Cannizzaro's reaction
c) Fittig's reaction d) Etard oxidation

261. Which of the following does not used to convert ketone to secondary alcohol?
a) $LiAlH_4$ b) $NaBH_4$
c) $H_2/Pd\text{-}BaSO_4$ d) Na + C_2H_5OH

262. The appropriate reagent for following transformation.



a) Zn.Hg + HC1 b) NH_2NH_2, KOH
c) H_2 + Ni d) both a and b

263. In the following sequence of reaction,

$$Toluene \xrightarrow{KMnO_4} A \xrightarrow{SOCl_2} B \xrightarrow[BaSO_4]{H_2+Pd} C.$$

The produce C is
a) $C_6H_5–COOH$ b) $C_6H_5–CH_3$
c) $C_6H_5–CHO$ d) $C_6H_5–CH_2–OH$

264. Which of the following is correct?

a) reduction of any aldehyde gives 2^0 alcohol

b) reduction of any ketone gives tertiary alcohols

c) Wolff-Kisher reduction convert > C = O to $-CH_2-OH$ group

d) Ozonolysis of alkene in the presence of zinc gives aldehydes or keones/mixture of aldehyde and ketones

265. Ozonolysis of C_7H_{14} give methanal and 2-methyl pentan-3-one. The C_7H_{14} is

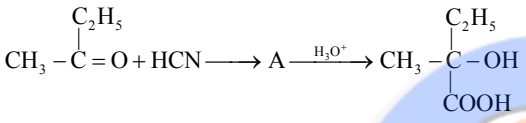
a) 2-ethyl 3-methyl but-1-ene

b) 3-ethyl-2-methyl but-3-ene

c) hept-1-ene

d) hept-2-ene

266. In the reaction



The acid obtained will be

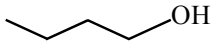
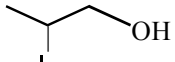
a) L-isomer

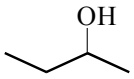
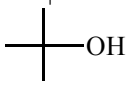
b) D-isomer

c) 20% D + 80% L-isomer

d) 50% D + 50% L-isomer

267. A substance $C_4H_{10}O$ yield on oxidation C_4H_8O which gives oxime and positive iodoform test. The original substance on treatment with cone. H_2SO_4 gives C_4H_8. The structure of compound is

a)  b) 

c)  d) 

268. Which of the following react with NaOH produces acid and alcohol?

a) C_6H_5CHO b) CH_3-CHO

c) CH_3COOH d) C_6H_5COOH

269. Which of the following is not correctly matched?

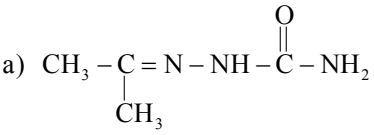
a) $>C=0 \xrightarrow[\text{reduction}]{\text{Clemmenson's}} >CH_2$

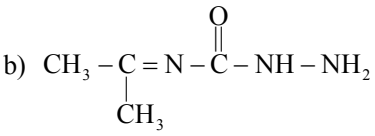
b) $>C=0 \xrightarrow[\text{reduction}]{\text{Wolff-Kishner}} >CH-OH$

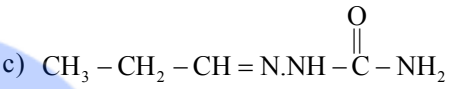
c) $-COCl \xrightarrow[\text{reduction}]{\text{Rosenmund's}} -CHO$

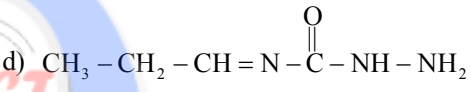
d) $-\equiv N \xrightarrow[\text{reduction}]{\text{Stephen's}} -CHO$

270. Compound A of formula C_3H_8O is treated with acidic $KMnO_3$ to form product B of formula C_3H_6O, which form shining silver mirror on warming with ammoniacal $AgNO_3$, when B is treated with $NH_2\ COHNH_2$ in HC1 and sodium acetate gives the product C. Identity the structure of C.

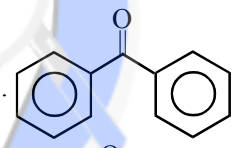
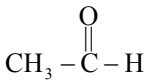
a) 

b) 

c) 

d) 

271. The correct order of reactivity of Ph-MgCl with

1.  2. 

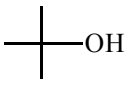
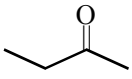
3. 

a) 1 > 2 > 3 b) 3 > 2 > 1

c) 2 > 3 > 1 d) 2 > 1 > 3

272. Which one of the following oxidised to corresponding carbonyl compound?

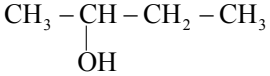
a)  b) 

c)  d) 

273. 2, 2-diethoxy butane is obtained from ethanol and what?

a) $CH_3-CH_2-CH_2-CHO$

b) $CH_3-COCH_2-CH_3$

c) 

d) $CH_3-CH_2-CH_2-CH_1-I$

274. Which reagent is used to convert butan-2-one to propionic acid?

a) Tollen's reagent b) Fehling's solution

c) acidic $KMnO_4$ d) PCC

275. The compounds HCHO and CH_3CHO on intermolecular aldol condensation gives.

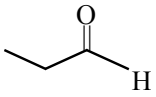
a) $HO–CH_2–CH_2–CHO$

b) $CH_3–CHOH–CH_2OH$

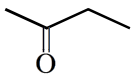
c) $CH_3–CHOH–CH_3$

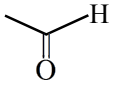
d) $CH_2–CHOH–CH_2–CH_2OH$

276. Nucleophilic addition reaction is most favored in

a) 

b) 

c) 

d) 

277. The smallest ketone and it's functional isomer are treated with $NH_2–OH$ to form oxime

a) two different oxime are formed

b) three different oxime are formed

c) two oximes are optically active

d) all oximes are optically active

278. $R-CO-R' \xrightarrow{HCN} A \xrightarrow{B} R-\underset{\displaystyle CH_2-NH_2}{\overset{\displaystyle OH}{\overset{|}{\underset{|}{C}}}}-R'$

A and B are

a) $A = R-\overset{\displaystyle OH}{\overset{|}{\underset{|}{C}}}-R'$ $\overset{\displaystyle CN}{}$ $B = Na + C_2H_5OH$

b) $A = R-\overset{\displaystyle OH}{\overset{|}{\underset{|}{C}}}-R'$ $\overset{\displaystyle COOH}{}$ $B = H_3O^+$

c) $A = R-\overset{\displaystyle OH}{\overset{|}{\underset{|}{C}}}-R'$ $\overset{\displaystyle CN}{}$ $B = NH_3$

d) $A = R-\overset{\displaystyle R'}{\underset{|}{CH}}-CN$ $B = NaOH$

279. On reaction with ketone with hydroxyl amine give ketoxime which on reduction produces

a) carboxylic acid b) 1^0 amine

c) 2^0-amine d) amide

280. Aldehyde with $NH_2–NH_2$ forms

a) aniline b) nitrobenzene

c) hydrazine d) hydrazone

281. $C_3H_6O \xrightarrow[\Delta]{OH^-}$ Mesityl oxide

The C_3H_6O is

a) $CH_3–CH_2–CHO$

b) CH_3COCH_3

c) $CH_2 = CH–CH_2–OH$

d) $CH_3-\underset{\displaystyle OH}{\overset{|}{\underset{|}{C}}}=CH_2$

282. 3-hydroxy 2-methyl pentanal is formed when X react with Y in dilute Z solution. What are X,Y,Z?

	X	Y	Z
a)	$CH_3–CHO$	$CH_3–CHO$	NaOH
b)	$C_2H_5–CHO$	$CH_3–CHO$	NaOH
c)	$C_2H_5–CHO$	$C_2H_5–CHO$	NaOH
d)	$C_2H_5–CHO$	$C_2H_5–CHO$	NaCl

283. A base can absract an α-H atom from

a) $CH_2 = CH_2$ b) CH = CH

c) $CH_3 – CHO$ d) $C_6H_5 – CHO$

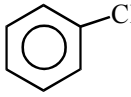
284. Which of the following pathways produces 2-pentanone ?

1. pent-1-yne is treated with $H_2SO_4 + HgSO_4$ and water
2. 3-methyl hex-2- ene is treated with O_3 followed by hydrolysis
3. n-butylmagnesium halide is reacted with formaldehyde
4. hydroboration oxidation of pent-1-ene

a) 1, 3 b) 1, 2

c) 2, 4 d) 1, 3, 4

285. Which of the following reagent react with same manner with



$H-CHO,\ CH_3-CHO,\ CH_3COCH_3$

a) Fehling's solution b) NH_3

c) HCN d) NaOH

286. Which statement is correct with ethanal and propanone

1. Both react with $NaHSO_3$
2. Both gives iodoform test
3. Both can be reduced into alcohols
4. Both undergoes aldol condensation

a) 1, 3 b) 2, 3
c) 2, 4 d) all of these

287. Which of the following react same manner with H–CHO and C_6H_5–CHO ?

a) Fehling's solution b) CH_3–MgX
c) NH_3 d) dil. NaOH

288. Acetone gives addition elimination reaction with

1. NH_2–OH
2. NH_2–CONH–NH_2
3. $NaHSO_3$
4. CH_3–NH_2

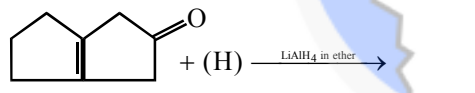
a) 2, 4 b) 3, 4
c) 1, 2, 4 d) 1, 2, 3

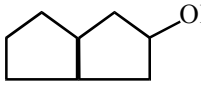
289. An carbonyl compounds gives nucleophilic addition reaction with

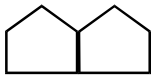
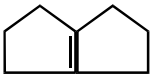
1. HCN
2. $NaSHO_3$
3. R–MgX
4. NH_2–NH_2

a) 1, 2 b) 2, 3
c) 1, 2, 4 d) 1, 2, 3

290. Product of the following reaction is



a)  b) 

c)  d) 

291. The product formed when HCHO is heated with conc. KOH

a) CH_3CHO b) CH_3OH
c) C_2H_2 d) CH_4

292. Formaldehyde reacts with NH_3 tourotropine which has the composition

a) $(CH_2)_5N_5$ b) $(CH_2)_5N_5$
c) $(CH_2)_4N_6$ d) $(CH_2)_6N_4$

293. Pinacol is converted in to pinacolone by

a) rearrangment b) oxidation
c) reduction d) hydrolysis

294. Aldehydes with Tollen's reagent are

a) reducing agent b) oxidising agents
c) hydrating agents d) bleaching agents

295. Low reactivity of ketones with respect to aldehydes is due to

a) greater + I effect of alkyl group
b) greater steric hindrance of alkyl group
c) both 'a' and 'b'
d) less steric hindrance of alkyl group

296. Aldehydes can be distinguished from ketones by using

a) dil. NaOH b) R–MgX
c) Na_2CO_3 d) Schiff's reagent

297. Which of the following are generally used for preparing derivatives of aldehydes and ketones?

a) Hydrocyanic acid
b) Hydroxylamine
c) Phenyl hydrazine
d) All of these

298. Which of the following is an example of aldol condensation ?

a) $2CH_3CHO \xrightarrow{OH^-} CH_3CH(OH)\,CH_2CHO$

b) $C_6H_5CHO \xrightarrow{OH^-} C_6H_5CH_2OH$

c) $HCHO \xrightarrow{OH^-} HCH_2OH$

d) $C_6H_5CHO + HCHO \xrightarrow{OH^-} C_6H_6CH_2OH$

299. Which of the following can be used to differentiate between acetaldehyde and propanal?

a) Ammonical $AgNO_3$
b) $CuSO_4$ + Na-K tartarate in NaOH
c) I_2 in the presence of base
d) Decolourised Fuchin

300. Molecular formula 'A' (C_4H_8O) reacts with CH_3MgI gives 3-methyl 2-butanol. The structure of A is

a) $CH_3CH_2CH_2CHO$
b) $C_2H_5COCH_3$
c) $(CH_3)_2CHCHO$
d) $C_2H_5OCH_3$

301. When acetone reacts with $Ba(OH)_2$ it gives

a) acetoxime b) urotropine
c) t-butyl alcohol d) diacetone alcohol

302. Which of the following aldehydes does not reduce Fehling solution readily ?
a) Acetaldehyde b) Formaldehyde
c) Propanal d) Benzaldehyde

303. 1-propanol is obtained from C_2H_5 Mgl and what?
a) CH3CHO b) HCHO
c) HCN d) C_5H_5CHO

304. Treatment of propionaldehyde with dil. NaOH solution gives
a) $CH_3CH_2COOCH_2C_2H_5$
b) $CH_3CH_2CHOHCH_2CH_2CHO$
c) $CH_3CH_2CH(OH)CH(CH_3)CHO$
d) $CH_3CH_2COCH_2CH_2CHO$

305. Oxidation number of carbon in HCHO is
a) 0 b) 2
c) 3 d) 4

306. Which of the following compound does not undergo aldol condensation?
a) Acetaldehyde
b) Propanal
c) Ethyl methyl ketone
d) Benzaldehyde

307. Which of the following compound undergoes aldol condensation?
a) CH_3CHO b) C_2H_5CHO
c) CH_3COCH_3 d) All

308. The reaction,

$$CH_3CHO + CH_3CHO \xrightarrow{\text{alkali}} CH_3CH(OH)CH_2CHO$$

represents
a) Cannizzaro reaction
b) Aldol condensation
c) Wurtz reaction
d) Mendius reaction

309. Mesityl oxide is formed by the condensation of
a) acetaldehyde b) acetone
c) propanal d) formaldehyde

310. The most probable compound whose molecular formula is C_3H_6O and which can give Tollen's reagent test
a) CH_3CH_2CHO b) CH_3COCH_3
c) $CH_3OCH_2CH_3$ d) $CH_2 = CHCH_2OH$

311. When two molecules of HCHO react in presence of base to produce CH_3OH and HCOONa, the reaction is called
a) Wurtz reaction b) Cannizzaro reaction
c) Aldol condensation d) Hoffman reaction

312. Aldol condensation of acetaldehyde results in the formation of
a) $CH_3COCHOHCH_3$
b) $CH_3CHOHCH_2CHO$
c) $CH_3CH_2CHOHCHO$
d) $CH_3CH_2OH + CH_3COOH$

313. Which of the following reagents can not be used to distinguish between pentanal and 2-pentanone?
a) I_2 in NaOH b) Fehling solution
c) Na metal d) Tollen's reagent

314. Acetaldehyde reacts with NH_2OH to give
a) acetal amine b) acetal oxide
c) acetaldoxime d) amino acetal

315. Which of the following statement is true?
a) Aldehydes are less susceptible to oxidation than ketones
b) All aldehydes undergo Cannizzaro reaction
c) Aldehydes are more susceptible to oxidation than ketones
d) Formaldehyde does not react with ammonia

316. Silver mirror test is given by
a) aldehyde b) ketones
c) amines d) ethers

317. Which of the following reagent is used to convert > C = O to > CH_2 ?
a) ZnHg + H_2O b) ZnHg + conc.HCl
c) NaHg + H_2O d) Sn + conc.HCl

318. The formation of acetone sodium bisulphite from a acetone is an example of
a) electrophilic addition
b) nucleophilic addition
c) nucleophilic substitution
d) electrophilic substitution

319. In which reaction new C–C bond does not form
a) Aldol b) Cannizzaro's
c) Wurtz d) HCN + RMgX

320. Mesityl oxide is
a) ketone b) aldehyde
c) ester d) ethers

321. Schiffs reagent is obtained by passing
a) SO_2 gas in aq. solution of rosaniline
b) NO_2 gas in aq. solution of rosaniline
c) O_2 gas in aq. solution of rosaniline
d) CO_2 gas in aq. sol. of rosaniline

322. Which of the following can reduce Tollen's reagent but not Fehling solution?
a) C_6H_5CHO b) CH_3CHO
c) C_3H_7CHO d) CH_3COCH_3

323. An aldehyde on oxidation gives
a) an alcohol b) an acid
c) an ether d) a ketone

324. Magenta is
a) alc. phenolphthalein
b) p-rosaniline hydrochloride
c) methyl red
d) red litmus

325. Aldehyde on reaction with Grignard reagent and subsequent hydrolysis yields
a) primary alcohol b) tertiary alcohol
c) secondary alcohol d) dihydroxy alcohol

326. Which of the following does not have alpha hydrogen?
a) Formaldehyde
b) Acetaldehyde
c) Dimethyl acetaldehyde
d) Acetone

327. Rochelle salt is
a) ammonium tartarate
b) sodium potassium tartarate
c) potassium ammonium tartarate
d) sodium tartarate

328. Fuschin is,
a) pink dye of para-rosa-aniline hydrochloride
b) Schiff s reagent
c) Tollen's reagent
d) Fehling solution

329. Which of the following is a gas at room temperature?
a) CH_3CHO b) HCHO
c) CH_3COCH_3 d) $C_2H_5OC_2H_5$

330. Clemmenson reduction is carried out with followed by treatment with glycolic KOH
a) H_2/Pd b) NH_2NH_2
c) $LiAlH_4$ in ether d) Zn(Hg)/HCl

331. Aldehydes having no cc-hydrogen atom undergo
a) Hoffman reaction
b) Aldol condensation
c) Cannizzaro reaction
d) Wurtz reaction

332. Which of the following does not react with phenyl hydrazine?
a) Ethanol b) Ethanal
c) Acetone d) 2-pentanone

333. Which of the following compound does not undergo Cannizzaro reaction?
a) Ethanol
b) Methanal
c) Benzaldehyde
d) 2, 2, 4, 4-tetra methyl 3-pentanone

334. Reduction in presence of amalgamated zinc and cone. HC1 is known as
a) Mendius reduction
b) Wurtz reaction
c) Hoffmanns reaction
d) Clemmenson's reduction

335. Aldehyde having no α-hydrogen undergo disproportionation in presence of strong potash to give a corresponding salt of acid and alcohol. The reaction is known as,
a) Wurtz reaction
b) Aldol condensation
c) Cannizzaro's reaction
d) Esterification

336. An organic compound contains H_2O and single carbon. It responds positive to Tollen's reagent. The compound is
a) HCHO b) CH_3OH
c) CH_3CHO d) none of these

337. Formaldehyde gives an addition product with methyl magnesium iodide which oh acid hydrolysis gives
a) CH_3OH b) C_2H_5OH
c) $(CH_3)_2CHOH$ d) $CH_3CHOHCH_5$

338. Formaldehyde and formic acid are distinguished by treating with
a) Tollen's reagent b) $NaHCO_3$
c) Fehling solution d) Schiff s reagent

339. Pick up the correct statements from the following
a) both aldehydes and ketones use sp^2-hybrid carbon atoms for their addition reaction
b) acetic acid neither reacts with Fehling's solution nor with Tollen's reagent
c) chloral is aldehyde
d) all are correct

340. Canal is heated with ammonical silver nitrate. The product formed is,
a) $CH_3CH_2CH_2COOH$
b) $(CH_3)_2CHCOOH$
c) $CH_3COOH + CH_3OH$
d) $HCOOH + C_2H_5COOH$

341. Fehling solution is
a) acidified $CuSO_4$ solution
b) ammonical AgNO3 solution
c) copper sulphate, sodium hydroxide and Rochelle salt
d) none of these

342. Union of two or more molecules of the same or different compound with elimination of water to form a new substance is known as
a) synthesis b) polymerisation
c) condensation d) none of these

343. Which of the following compound will undergo self aldol condensation in presence of dilute alkali?
a) C_6H_5CHO b) $(CH_3)_3CCHO$
c) C_2H_5CHO d) $CC1_3CHO$

344. When a ketone is condensed into an ketol, the reagent used is
a) Na_2CO_3 b) $NaHCO_3$
c) Br_2 water d) $C1_2$

345. Benzaldehyde undergoes auto-oxidation and reduction in presence of
a) conc. NaOH b) $Na2CO_3$
c) $NaHCO_3$ d) dil. NaOH

346. Nucleophilic attack on carbonyl carbon changed its hydridisation from
a) sp to sp^2 b) sp^2 to sp^3
c) sp^3 to sp^2 d) sp to sp^3

347. Which of the following reaction is used for detecting the presence of carbonyl group in aldehydes and ketones ?
a) Reaction with hydroxylamine
b) Reaction with phenyl hydrazine
c) Reaction with hydrazine
d) All of these

348. Which of the following reagent form oxime with carbonyl compound ?
a) NH_3OH b) NH_2OH
c) NaOH d) CH_2N_2

349. Ketonic form of acetone contains
a) 8-σ bonds and 2-π bonds
b) 9-σ bonds and 1-π bond
c) 7-σ bonds and 3-π bonds
d) 4-σ bonds and 5-π bonds

350. β-hydroxy butyraldehyde is an example of
a) aldol b) ketol
c) ester d) alcohol

351. Which is most difficult to oxidise ?
a) HCHO b) CH_3COCH_3
c) CH_3CHO d) C_2H_5CHO

352. Aldehydes or ketones having atleast one α-hydrogen undergo condensation reaction in presence of dilute base. This reaction is called
a) Aldol condensation
b) Cannizzaro's reaction
c) Hoffmann's reaction
a) Mendius reaction

353. The reagent with which both aldehyde and acetone react easily is
a) Fehling's reagent b) Grignard reagent
c) Schiff s reagent d) Tollen's reagent

354. When, acetaldehyde is heated with Tollen's reagent, following is obtained
a) Methyl alcohol b) Silver acetate
c) Silver mirror d) Formaldehyde

355. Which of the following compounds would undergo Cannizzaro's reaction
a) Propionaldehyde b) Benzaldehyde
c) Bromobenzene d) Acetaldehyde

356. Schiff s reagent gives pink colour with
a) Aldehydes b) Ethers
c) Ketones d) Carboxylic acid

357. An aldehyde on oxidation gives
a) An alcohol b) An acid
c) A ketone d) An ether

358. Schiff s reagent is
a) Magneta solution decolourised with SO_2
b) Ammonical cobalt chloride solution
c) Ammonical manganese sulphate solution
d) Magneta solution decolourised with chlorine

359. Acetone and acetaldehyde are differentiated by
a) $NaOH + I_2$ b) $Ag(NH_3)_2^+$
c) HNO_2 d) I_2

360. Hexamethylene tetramine is used as
a) analgesic b) antipyretic
c) urinary antiseptic d) all the above

361. Benzyl alcohol is obtained from benzaldehyde by
a) Fitting's reaction b) Cannizaro's reaction
c) Kolbe's reaction d) Wurtz's reaction

362. Which of the following gives difference between aldehyde and ketone?
a) Fehling's solution b) Tollen's reagent
c) Schiff's reagent d) All of the above

363. Formaldehyde gives an additive product with ethyl magnesium iodide which on aqueous hydrolysis gives
a) isopropyl alcohol b) ethyl alcohol
c) methyl alcohol d) n-propyl alcohol

364. The reagent which easily reacts with ethanal and propanalis
a) Fehling's solution b) Grignardreagent
c) Schiffs reagent d) Tollen's reagent

365. Magnetais
a) alkaline phenolphthalein
b) methyl red
c) p-rosanilinehydrochloride
d) red litmus

366. Grignard reagent on reaction with ketones for
a) tertiary alcohol b) secondary alcohol
c) acetic acid d) acetaldehyde

367. The compound which reacts with Fehling solutionis
a) C_6H_5COOH b) $HCOOH$
c) C_6H_5CHO d) CH_2ClCH_3

368. Acetone gives test with
a) Phenyl hydrazine b) Fehling solution
c) Schiffs reagent d) All the above

369. An aldehyde can undergo the aldol condensation having
a) an aromatic ring
b) no alpha H atom
c) atleast one α-H atom
d) at least one β-H atom

370. An organic compund 'X' having molecular formula $C_5H_{10}O$ yields phenyl hydrazone and gives negative response to the iodoform test and Tollen's test. It produces n-pentane on reduction 'X' could be :
a) pentanal b) 2-pentanone
c) 3-pentanone d) n-amyl alcohol

371. Aldol condensation will not take place in
a) HCHO b) CH_3CHO
c) CH_3COCH_3 d) CH_3CH_2CHO

372. CH_3COCH_3 can be converted to $CH_3CH_2CH_3$ the action of
a) HIO_3 b) ZnHg + HCl
c) HNO_3 d) H_3PO_3

373. The compound most suitable for the preparation of cyanohydrin is
a) C_2H_5COOH b) $C_2H_5COC_2H_5$
c) $C_6H_5NH_2$ d) $C_2H_5–C_2H_5$

374. Baking powder is
a) $NaHCO_3$ b) $NaHCO_3.6H_2O$
c) Na_2CO_3 d) $Na_2CO_3.10H_2O$

375. Which one of the following undergoes reaction with 50% sodium hydroxide solution to give the corresponding alcohol and acid ?
a) Butanal b) Formaldehyde
c) Phenol d) Benzoic acid

376. Which of the following compounds can be regenerated to carbonyl compounds?
a) Urotropin b) Bisulphite complex
c) Cynohydrine d) Diacetone amine

377. What is 'C' in the following reaction?

$$C_6H_5CN + C_6H_5MgI \xrightarrow[(ii)\ H_3O^+]{(i)\ \text{dry ether}}$$

$$A \xrightarrow{NH_2OH} B \xrightarrow{LiAlH_4}$$

a) diphenyl methane
b) diphenyl methanamine
c) nitrodiphenyl methane
d) diphenyl


DGT

SECTION-II: CARBOXYLIC ACIDS

Introduction, Nomenclature, Isomerism

1. General formula for carboxylic acid is
a) $C_nH_nO_2$ b) $C_nH_{2n}O_2$
c) $C_nH_{2n}O$ d) $C_nH_{2n+2}O_2$

2. The general formula of an ester, where R represents an alkyl group, is
a) ROH b) RCOOH
c) RCOOR d) ROR

3. Vinegar contains acetic acid nearly
a) 6-10% b) 30%
c) 12-15% d) 20%

4. The bite of honey-bee inject into our body
a) acetic acid b) formic acid
c) butyric acid d) carbolic acid

5. Glacial acetic acid at low temperature is a
a) thin liquid b) viscous liquid
c) ice like solid d) semi solid

6. The suffix used in carboxylic acid is
a) -oic b) -ane
c) ene d) -al

7. Formic acid owes its origin to
a) milk b) butter
c) red ants d) vinegar

8. Vinegar obtained from canesugar contains
a) Citric acid b) Lactic acid
c) Acetic acid d) Palmitic acid

9. Write the IUPAC name of CH_3CH_2COOH.
a) ethyl formic acid
b) ethyl carboxylic acid
c) ethane methanoic acid
d) propanoic acid

10. IUPAC name m-toluic acid is
a) 3-methyl benzoic acid
b) 2-methyl benzoic acid
c) 4-methyl benzoic acid
d) 2,4-dimethyl benzoic acid

11. IUPAC name of carboxylic acid is
a) alkinoic acid b) alkanoic acid
c) alkenoic acid d) alkyl alkanoate

12. IUPAC name of ester is
a) alkoxy alkane b) alkoxy alkene
c) alkane alkanoate d) alkyl alkanoate

13. IUPAC name of isobutyric acid is.
a) 3-methyl propionic acid
b) 2-methyl propanoic acid
c) 3-methyl butanoic acid
d) isobutanoic acid

14. IUPAC name of following compound is $(CH_3)_2CHCOOC_2H_5$
a) ethyl isobutanoate
b) ethyl isobutyrate
c) ethyl 2-methyl propanoate
d) ethyl 1-methyl ethanoate

15. IUPAC name of following compound is $(CH_3)_3C–CH_2–COOH$
a) 2,2-dimethyl butanoic acid
b) 3, 3-dimethyl butanoic acid
c) 2,3-dimethyl propanoic acid
d) 2,3-dimethyl butanoic acid

16. IUPAC name of following compound is $C_2H_5–COOCH(CH_3)_2$
a) isopropyl propanoate
b) isopropyl propionate
c) 2-propyl propanoate
d) 2-propyl ethanoate

17. Structure of ethyl ethanoate is
a) $CH_3COOC_2H_5$ b) $C_2H_5COOCH_3$
c) $H–COOC_2H_5$ d) $H–COOCH_3$

18. An organic compound having the molecular formula $C_2H_4O_2$ is
a) formic acid b) acetic acid
c) ethyl acetate d) propionic acid

19. Aliphatic carboxylic acids shows isomer of type
a) position b) chain
c) functional d) all of these

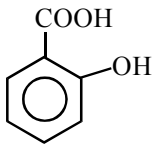
20. Carboxylic acid is isomeric with
a) aldehydes b) alcohols
c) easter d) saturated ketones

21. Acids and esters are
a) chain isomers b) position isomers
c) functional isomers d) metamers

22. Molecular formula $C_2H_4O_2$ represents
a) acids b) esters
c) aldehydes d) both 'a' and 'b'

23. Molecular formula $C_2H_4O_2$ shows
a) chain isomerism
b) position isomerism
c) functional isomerism
d) metamerism

24. IUPAC name of following compound is



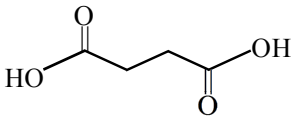
a) 2-carboxy phenol
b) 2-carboxy benzyl alcohol
c) 2-hydroxy benzoic acid
d) 2-hydroxy benzene carboxylic acid

25. How many carboxylic acids are possible for $C_4H_8O_2$?
a) 2 b) 3
c) 4 d) 5

26. Total number of isomeric acids can be calculated by formula
a) $I = 2^{n-1}$ b) $I = 2^{n-3}$
c) $I = 2^n$ d) $I = 2^{n-2} - 1$

27. Citric acid is
a) monocarboxylic acid
b) dicarboxylic acid
c) tricarboxylic acid
d) fatty acid

28. The following structure is



a) oxalic acid b) phthalic acid
c) fumaric acid d) succinic acid

29. The acid which is obtained from plant
a) Propionic acid b) valeric acid
c) fumaric d) malic acid

30. Lemon is sour due to
a) Oxalic acid b) tartaric acid
c) citric acid d) malic acid

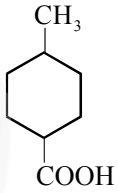
31. Saturated monocarboxylic acid is second oxidative product of
a) 1^0 alcohol b) 2^0 alcohol
c) both a & b d) ketones

32. Monocarboxylic acid shows functional isomerism with
1) Ester 2) aldehydes
3) ketones 4) ether
a) 1, 2 b) 1
c) 2, 3 d) 3, 4

33. IUPAC name of malic acid is
a) 3-hydroxy butanoic acid
b) 2-hydroxy butanedioic acid
c) 2-hydroxy butanoic acid
d) 2-hydroxy pentanedioic acid

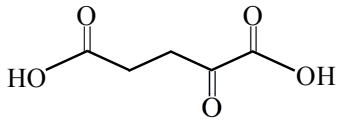
34. IUPAC name of p-methyl butyric acid is
a) 3-methyl butanoic acid
b) 4-methyl pentanoic acid
c) 2-methyl butanoic acid
d) 2-methyl propanoic acid

35. IUPAC name of following compound is



a) 4-methyl cyclohexane 1-carboxylic acid
b) 4-carboxyl 1-methyl cyclohexane
c) m-Tbluic acid
d) o-Toluic acid

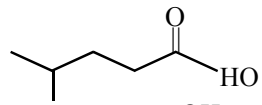
36. IUPAC name of following compound is,

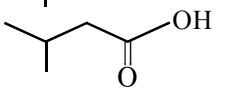


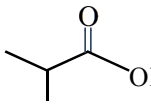
a) 2-oxo butane dioic acid
b) 2-oxo propane 1, 3-dicarboxylic acid
c) 2-oxo 1, 5-pentane dioic acid
d) Hexane dioic acid

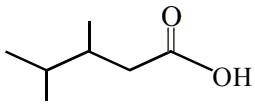
37. The IUPAC name of caproic acid is
a) pentanoic acid
b) 2-phenyl ethanoic acid
c) 2-phenyl propanoic acid
d) hexanoic acid

38. Which of the following is isobutyric acid ?

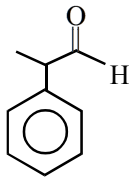
a) 

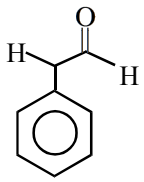
b) 

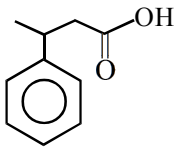
c) 

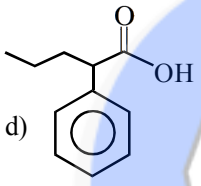
d) 

39. Which of the following is 2-phenyl pentanoic acid?

a) 

b) 

c) 

d) 

40. n-valeric acid is functional isomer of

a) methyl propionate b) n-butyl formate

c) propyl isobutyrate d) ethyl isobutyrate

41. Butyric acid and isobutyric acid are

a) chain isomers b) position isomers

c) metamers d) tautomers

42. Which isomers of $C_5H_{10}O_2$ shows optical isomerism?

a) 2-methyl butanoic acid

b) valeric acid

c) neo-valeric acid

d) 3-methyl butanoic acid

43. How many carboxylic acids are possible for molecular formula $C_5H_{10}O_2$?

a) 3 b) 4

c) 5 d) 6

44. Molecular formula $C_4H_8O_2$ shows

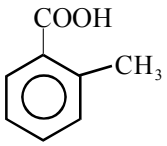
1) chain 2) metamerism

3) functional 4) optical

a) 1, 2, 3 b) 3, 4

c) 2, 3, 4 d) all of these

45. Common name of the following compound is



a) o-Toluic acid b) m-Toluic acid

c) p-Toluic acid d) Phthalic acid

46. IUPAC name of malonic acid is

a) propane dioic acid b) ethane dioic acid

c) butane dioic acid d) pentane dioic acid

47. Carbon atom in carboxyl group is

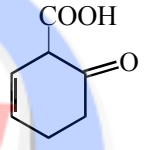
a) sp-hybridised state

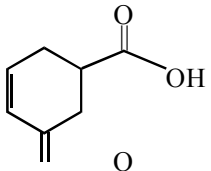
b) sp^2 hybridised state

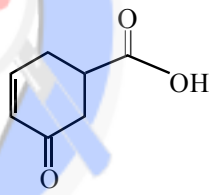
c) sp^3 hybridised state

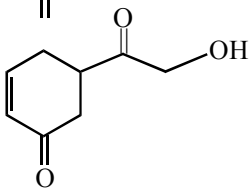
d) sp^3 d hybridised state

48. Which of the following is 3-oxo cyclohex-4-ene-1-carboxylic acid?

a) 

b) 

c) 

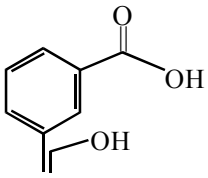
d) 

49. Which of the following is not fatty acid?

a) propionic acid b) butyric acid

c) iso-butyric acid d) iso-phthalic acid

50. IUPAC name of following acid is



a) isophthalic acid

b) benzene 1, 3-dicarboxylic acid

c) phenyl 1, 3-dicarboxylic acid

d) terephthalic acid

51. Carboxylic acid do not give characteristic property of

a) R-group b) –COOH group

c) >C = O group d) –O–H group

Preparation Methods

52. Consider the following sequence of reactions and identify the final product (Y)

$$CH_3CH_2CH_2Br \xrightarrow[\text{dry ether}]{Mg} X \xrightarrow[\text{dry ether}]{CO_2/H_3O^+} Y$$

a) CH_3CH_2COOH
b) $(CH_3)_2CHCOOH$
c) $CH_3CH_2CH_2CH_2COOH$
d) $CH_3CH_2CH_2COOH$

53. Solid carbondioxide and RMgX produces
a) alkanoic acid b) alkanal
c) alkanone d) alkyl alkanoate

54. Carbonation of CH_3MgI gives an organic compound. This compound is also obtained by
a) hydrolysis of acetonitrile by a mineral acid
b) oxidation of methyl alcohol
c) hydrolysis of isoacetonitrile by a mineral acid
d) hydrolysis of methyl formate with dilute mineral acid

55. Propyl propionate is prepared from which of the following
a) $CH_3CH_2CH_2OH, CH_3CH_2COOH$
b) $CH_3COOH, CH_3(CH_2)_3COOH$
c) $CH_3CHOHCH_3, CH_3CH_2COOH$
d) $CH_3CH_2CH_2OH, (CH_3)_2CHCOOH$

56. A mixture of carboxylic acid (A) and alcohol (B) on heating give and ester (C) having molecular mass 74. What is (C)?
a) $HCOOC_2H_5$ b) $CH_3COOCHg$
c) Both 'a' and 'b' d) None of these

57. CH_3–CH_2–COOH can be obtained in following synthesis

a) $CH_3-CH_2-CN \xrightarrow{OH^-}$

b) $CH_3-CH_2-CN \xrightarrow{H_3O^+}$

c) $CH_3-CH_2-CN \xrightarrow{N_2+Ni}$

d) $CH_3-CH_2-CN \xrightarrow{CH_3MgX}$

58. $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$ can be converted to CH_3–COOH by following method.

1. $CH_3-COCH_3 \xrightarrow{I_2+NaOH}$

2. $CH_3-COCH_3 \xrightarrow{K_2Cr_2O_7+H^+}$

3. $CH_3-COCH_3 \xrightarrow{Ag(NH_3)_2^+}$

a) only 2 b) 1 and 2
c) 2 and 3 d) 1 and 3

59. Which is leaving group in the hydrolysis of $CH_3COOC_2H_5$?
a) $C_2H_5^+$ b) $C_2H_5O^-$
c) CH_3COO^- d) CH_3^-

60. For the preparation of isopropyl acetate from esterification. The compounds used as,
a) CH_3COOH and CH_3CH_2OH
b) $(CH_3)_2CHCOOH$ and CH_3OH
c) CH_3COOH and $(CH_3)_2CHOH$
d) C_2H_3COOH and CH_3OH

61. Find out X in the following reaction

$$X + CH_3OH \xrightarrow{\text{conc. } H_2SO_4} C_2H_5COOCH_3 + H_2O$$

a) C_2H_5–X b) $(CH_3CO)_2O$
c) CH_3COOH d) C_2H_5COOH

62. Ethyl propionate is formed from ethyl iodide and what?
a) C_2H_5COOH b) C_2H_5COOAg
c) $(C_2H_5CO)_2O$ d) All of these

63. Propanoic acid is the oxidative product of
a) ethanol b) 3-pentanone
c) 1-butanol d) 2-propanol

64. Reaction

$$CH_3COOH + C_2H_5OH \longrightarrow CH_3COOC_2H_5 + H_2O$$

is an illustration of
a) dehydration b) esterification
c) neutralization d) dehydrogenation

65. R–CH_2–CH_2OH can be converted into RCH_2COOH. The reaction is
a) reduction b) hydrolysis
c) oxidation d) decarboxylation

66. If hydrolysis of ester is carried out in presence of an acid, using water containing radioactive oxygen atom, the product most likely to be radioactive is
a) alcohol b) ester
c) acid d) both 'a' and 'c'

67. If acetic acid reacts with methyl alcohol containing labelled oxygen atom. In presence of dry HC1, the labelled oxygen atom, at the complete reaction will be found in
a) methyl acetate
b) water
c) may be 'a' and 'b'
d) not predictable

68. Propionic acid is obtained from dry ice and what?
a) CHgMgI b) C_2H_5MgBr
c) C_3H_7MgBr d) None of these

69. Carbonation of Grignard reagent followed by hydrolysis gives
a) aldehyde b) acid
c) ketone d) primary alcohol

70. Which of one the esters is formed by esterification of propan-2-ol with acetic acid?
a) $(CH_3)_2CHCOOCH_3$
b) $CH_3COOCH(CH_3)_2$
c) $CH_3CH_2CH_2COOCH_3$
d) $(CH_3)_2CHCOOCH_2CH_3$

71. CH_3COCH_3 can be converted into CH_3COOH by
a) reduction b) hydrolysis
c) decarboxylation d) oxidation

72. Which reaction does not have the correct oxidising agent?
a) $CH_3-COCH_3 \xrightarrow{PCC} CH_3COOH$
b) $CH_3-CHO \xrightarrow{Ag(NH_3)^+} CH_3COOH$
c) $CH_3-CHO \xrightarrow{Cr_2O_7^{2-}/H^+} CH_3COOH$
d) $CH_3COCH_3 \xrightarrow{Cr_2O_7^{2-}/H^+} CH_3COOH$

73. For the following reaction

$R-CN \xrightarrow{H_2O^+} R-COOH$

a) there is protonation of electronegative nitrogen
b) an amide is formed as an intermediate
c) nitrogen atom is expelled as ammonia
d) all are correct

74. Acetylation is the introduction of
a) CH_3COOH group b) R–CO group
c) $CH_3CH_2O^-$ d) CH_3–CO

75. 2-methyl propane nitrile on acid hydrolysis give
a) butyric acid b) isobutyric acid
c) propionic acid d) pentanoic

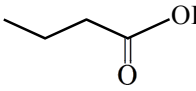
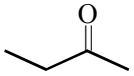
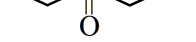
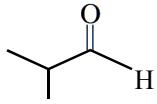
76. In esterification reaction the correct order of reactivity of alcohol is
a) $1^0 > 2^0 > 3^0$ b) $3^0 > 2^0 > 1^0$
c) $1^0 > 3^0 > 2^0$ d) $3^0 > 1^0 > 2^0$

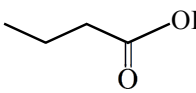
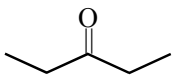
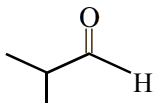
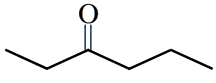
77. Monocarboxylic acid are regarded as _____ oxidation product of aldehyde
a) first b) second
c) third d) fourth

78. Formic acid is obtained when
a) Acetaldehyde is oxidised by acidic $KMnO_4$
b) Calcium formate is heated with calcium acetate
c) Methanol is oxidised by PCC
d) Methanol is oxidised by acidic dichromate

79. Which of the following acid containing aldehyde group?
a) CH_3–COOH b) H–COOH
c) HOOC–COOH d) $(CH_3)_2CH$–COOH

80. Formic acid is not representative member of carboxylic acid because
a) it is first member of the series
b) it does not contain alkyl group
c) it is a gas
d) it reduced Tollen's reagent

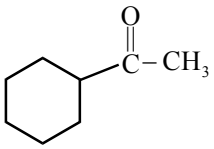
81. Molecular formula C_4H_8O on oxidation gives acetic acid. The structure of $C_4H_8O_9$ will be
a)  b) 
c)  d) 

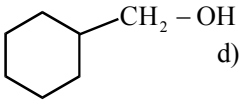
82. Mixture of acetic acid and propionic acid is obtained by oxidation of
a)  b) 
c)  d) 

83. Isobutyric acid is obtained by oxidation of
a) butanal
b) 2-methyl propanal
c) 2-methyl propan-1-ol
d) both b and c

84. 1-phenyl ethanone on oxidation gives
a) salicylic acid b) benzoic acid
c) succinic acid d) phthalic acid

85. Cyclohexane carboxylic acid is obtained by oxidation of

a)  b) 

c)  d) both b and c

86. Following compound on oxidation by acidic $KMnO_4$ gives

a) Adipic acid b) succinic acid
c) fumaric acid d) maleic acid

87. Benzoic acid is obtained by oxidation of
1. benzaldehyde 2. benzyl alcohol
3. Acetophenone
a) only 1 b) 2, 3
c) 1, 3 d) 1, 2, 3

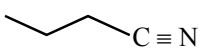
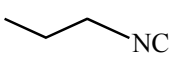
88. Find out A in the following reaction

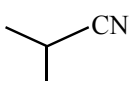
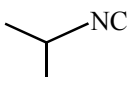
$$A \xrightarrow{\text{aq. KOH}} B \xrightarrow{PCC} \text{propanal}$$

a) n-propyl alcohol b) n-propyl halide
c) n-propyl amine d) diethyl ether

89. Acid hydrolysis of cyanide may produces
a) carboxylic acid b) mineral acid
c) aldehyde d) amine

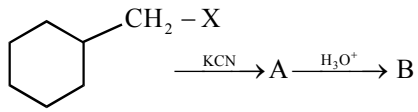
90. Molecular formula C_4H_7N on acid hydrolysis gives 2-methyl propanoic acid. The possible structure of C_4H_7N will be

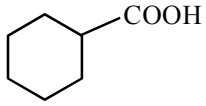
a)  b) 

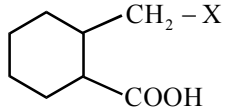
c)  d) 

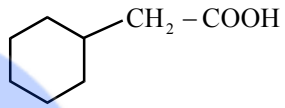
91. Benzoic acid is obtained by acid hydrolysis of
a) benzonitrile
b) 2-phenyl ethane nitrile
c) phenylisocyanide
d) 2-phenyl ethane isonitrile

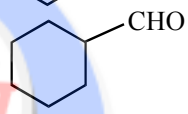
92. Find out final product in following reaction



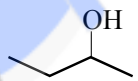
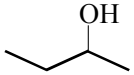
a) 

b) 

c) 

d) 

93. Compound A an hydrohalogentation gives B, which is treated with alc.KCN and followed by acid hydrolysis give 2-methyl butanoic acid. The compound A will be

a)  b) 

c)  d) 

94. Hexane dioic acid is obtained by oxidation of
a) benzene
b) cyclohexane
c) cyclohexene
d) cyclohexane carbaldehyde

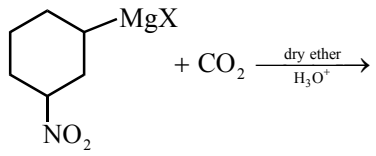
95. Find out missing compound in following reaction

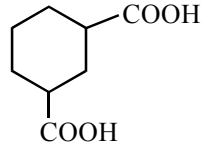
$$CO_2 + ? \xrightarrow[H_3O^+]{\text{dry ether}} R - COOH$$

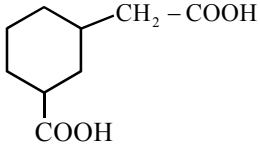
a) R–X b) R–Li
c) R–MgX d) R–ONa

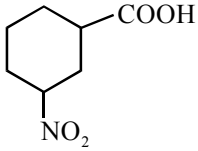
96. Dry ice and benzyl magnesium halide produces
a) benzoic acid
b) phthalic acid
c) 2-phenyl ethanoic acid
d) 2-phenyl propanoic acid

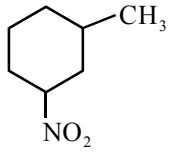
97. Product of the following reaction is



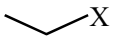
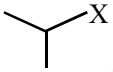
a) 

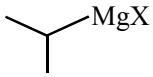
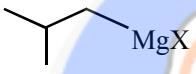
b) 

c) 

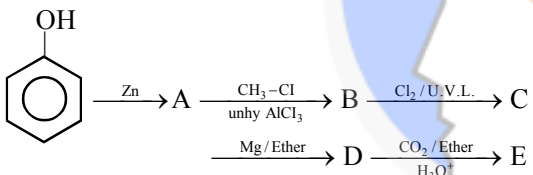
d) 

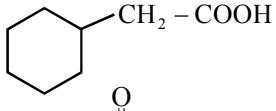
98. 2-methyl propanoic acid is obtained from dry ice and what

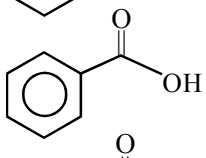
a)  b) 

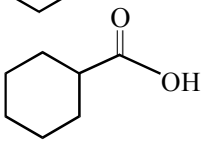
c)  d) 

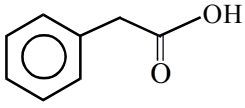
99. Find out final product 'E' in the following reaction series



a) 

b) 

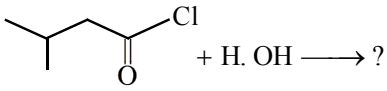
c) 

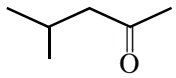
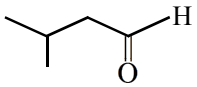
d) 

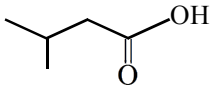
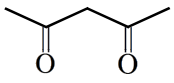
100. Hydrolysis of acyl halide give

a) aldehydes
b) ketones
c) carboxylic acids
d) ester

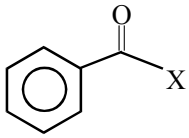
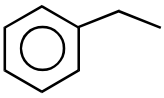
101. Following compound on hydrolysis give

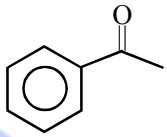
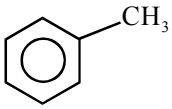


a)  b) 

c)  d) 

102. Benzoic acid is obtained by hydrolysis of

a)  b) 

c)  d) 

103. 1-phenyl ethanoyl chloride on hydrolysis gives

a) ethanoic acid
b) 1-phenyl ethanoic acid
c) 2-phenyl ethanoic acid
d) benzoic acid

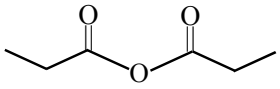
104. Hydrolysis of acid anhydride gives

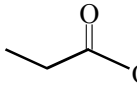
a) aldehydes b) ketones
c) acid amides d) carboxylic acids

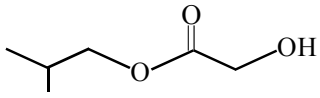
105. Hydrolysis of ethanoic anhydride gives

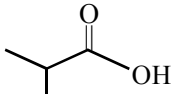
a) methanoic acid b) propanoic acid
c) ethanoic acid d) oxalic acid

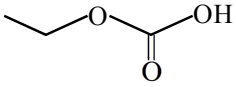
106. product compound on hydrolysis give



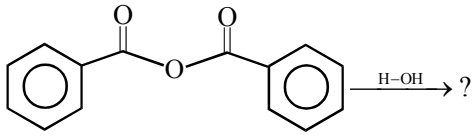
a) 

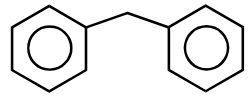
b) 

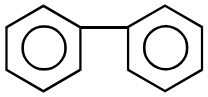
c) 

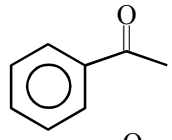
d) 

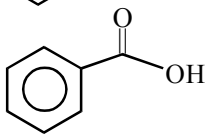
107. Product of the following reaction is



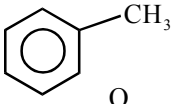
a) 

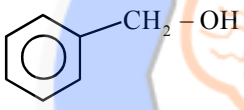
b) 

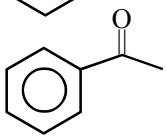
c) 

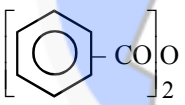
d) 

108. Which of the following compound does not gives benzoic acid on oxidation?

a) 

b) 

c) 

d) 

109. Benzoic acetic anhydride on hydrolysis gives

a) benzoic acid

b) acetic acid

c) mixture of benzoic acid and acetic acid

d) benzylalcohol and acetic acid

110. Product 'B' in the following reaction

$CH_3–CH_2–COX$

$\xrightarrow{Pd.BaSO_4 + \text{quinoline}} A \xrightarrow{[O]} B$

a) $CH_3–CH_2–COOH$

b) $CH_3–COOH$

c) $CH_3–CH_2–CHO$

d) $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$

111. Acid hydrolysis of ester produces

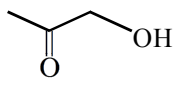
a) carboxylic acid

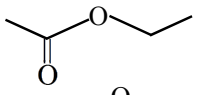
b) alcohol

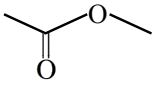
c) carboxylic acid and alcohol

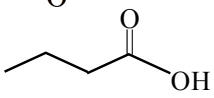
d) aldehyde and ketone

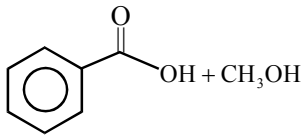
112. Molecular formula $C_4H_8O_2$ on acid hydrolysis give acetic acid and ethanol. The structures of $C_4H_8O_9$ will be

a) 

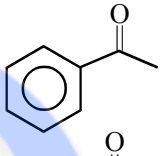
b) 

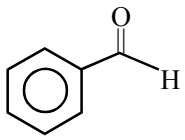
c) 

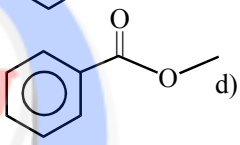
d) 

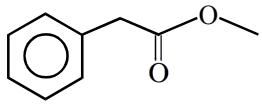
113. A + H . OH 

The compound A is

a) 

b) 

c) 

d) 

114. Molecular formula $C_3H_6O_2$ on acid hydrolysis gives A and B. The compound 'A' reduce Tollens reagent. The possible structure of $C_3H_6O_2$ will be

a) $CH_3–CH_2–COOH$ b) $CH_3–COOCH_3$

c) $H–COOC_2H_5$ d) $CH_3–C–CH_3$

115. Which of the following method cannot be used in the preparation of acid ?

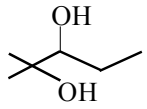
a) $R-COCl + H_2O \longrightarrow$

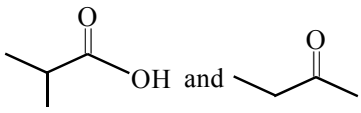
b) $R-COOOC-R + H_2O \longrightarrow$

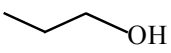
c) $R-COOR + H_2O \xrightarrow{H^+}$

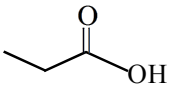
d) $R-C\equiv N \xrightarrow{Na + \text{ethanol}}$

116. Vigorous oxidation by acidic permagnet solution of $(CH_3)C = CH–CH_2CH_3$ gives

a) 

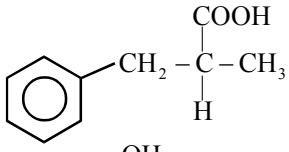
b) 

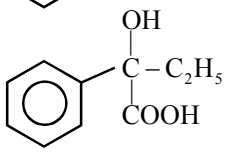
c)  and 

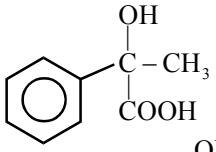
d)  and 

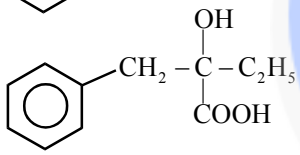
117. A set of reaction yielded a product D.

$$C_2H_5COOH \xrightarrow{SOCl_2} A \xrightarrow[\text{unhy. } AlCl_3]{C_6H_6} B \xrightarrow{HCN} C \xrightarrow{H_3O^+} D$$

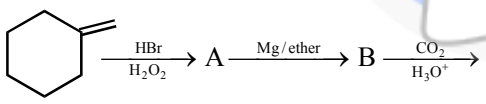
a) 

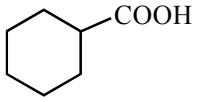
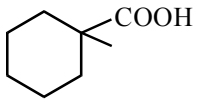
b) 

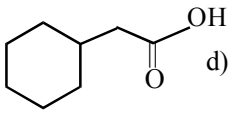
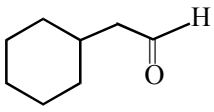
c) 

d) 

118. Product of the following reaction



a)  b) 

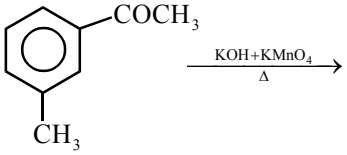
c)  d) 

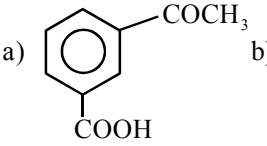
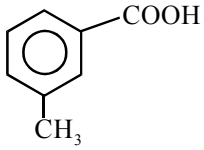
119. Alkyl benzene on oxidation by alkaline $KMnO_4$ gives

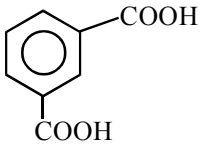
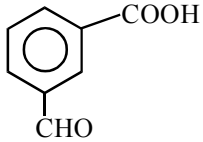
a) aldehyde b) ketone

c) carboxylic acid d) esters

120. Product of the reaction



a)  b) 

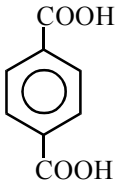
c)  d) 

121. o-xylene on oxidation gives

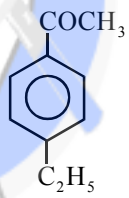
a) phthalic acid b) isophthalic acid

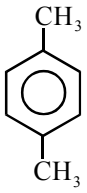
c) terephthalic acid d) citric acid

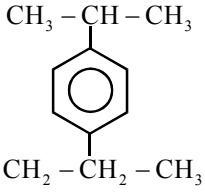
122. Following compound is obtained by oxidation is



1) 

2) 

3) 

4) 

a) 1, 3 b) 2, 3

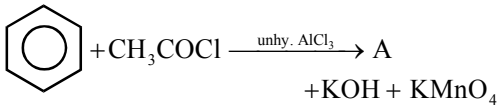
c) 2, 4 d) 1, 2, 3, 4

123. Phenyl ethene on oxidation produces

a) phthalic acid b) p-ethenyl benzoic acid

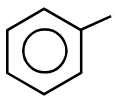
c) benzoic acid d) salicylic acid

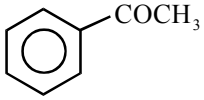
124. Find out final product of the reaction

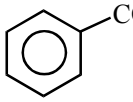


$$+CH_3COCl \xrightarrow{\text{unhy. } AlCl_3} A \xrightarrow{+KOH + KMnO_4}$$

a) 

b) 

c) 

d) 

125. Potassium salt of isophthalic acid on acid hydrolysis gives

a) phthalic acid b) isophthalic acid
c) terephthalic acid d) benzoic acid

126. Carbonation of organometallic reagent

a) is a one carbon homologation
b) involves its carbanionic attacks on electron deficient carbonyl carbon
c) both are correct
d) none is correct

127. Hydrolysis of nitrites with alkaline solution gives

a) salt of acid b) amides
c) acid d) esters

128. The mechanism of carbonation of organometallic compound is analogous to that of addition to

a) aldehyde and ketones
b) nitriles c) alcohols
d) amines

129. Dry ice reacts with n-propyl magnesium iodide to give

a) propyl acetic acid b) propionic acid
c) butanoic acid d) none of these

130. Esterification reaction is

a) nucleophilic substitution
b) electrophilic substitution
c) electrophilic addition
d) dehydration

131. In which case R–COOH is not product ?

a) $R-CN + RMgX \longrightarrow$

b) $R-CN \xrightarrow{H_3O^+}$

c) $R-MgX \xrightarrow{CO_2}$

d) $RCOR \xrightarrow{\text{Oxidation}}$

132. In esterification reaction concentrated H_2SO_4 act as

a) dehydrating agent b) catalyst
c) reducing agent d) oxidising agent

133. After completion of esterification, excess of alcohol is removed by using

a) $CaCl_2$ b) $CaOCl_2$
c) Na_2CO_3 d) NaOH

134. Synthesis of ester involves the reaction of alcohol with

a) a ketone b) an amide
c) CH_3MgBr d) RCOOH

135. Which of the following reagent produces 2-methyl propanoic acid with dry ice ?

a) CHgMgI b) C_2H_5MgI
c) $(CH_3)_2CHMgI$ d) C_3H_7MgI

136. 1-propanol on oxidation give

a) propanal b) propionic acid
c) propanone d) ethanal

137. –CN group is converted into –COOH group by

a) hydrolysis b) oxidation
c) reduction d) esterification

138. Esters are formed from acid by the replacement of

a) non-ionisable H atom by alkyl group
b) ionisable H atom by alkyl group
c) OH group by RO group
d) both 'b' and 'c'

139. Which one of the following correctly represents esterification reaction

a) $RCO\boxed{OH+H}O-R' \longrightarrow R-COOR' + H_2O$

b) $RCOO\boxed{H+HO}-R' \longrightarrow R-COOR' + H_2O$

c) $RCO\boxed{OH+H}O-R' \longrightarrow R'-COOR + H_2O$

d) $RCOO\boxed{H+HO}-R' \longrightarrow R'-COOR + H_2O$

140. The compound formed when propyl magnesium bromide is treated with carbon dioxide is

a) C_3H_7COOH b) C_2H_5COOH
c) C_3H_7CHO d) $C_3H_7OCH_3$

141. The alkyl cyanides when hydrolysed to the corresponding acid, the gas evolved is

a) N_2 b) O_2
c) NH_3 d) CO_2

142. In esteriflcation of an acid, the other reagent is
a) Alcohol b) An aldehyde
c) Amine d) Water

143. When methyl cyanide is hydrolysed in presence of alkali and followed by treatment with HC1. The product is
a) Acetamide b) Methane
c) Formic acid d) Acetic acid

144. Which product is formed, when acetonitrile is hydrolysed partially with dil. HC1 ?
a) Acetic acid b) Acetamide
c) Methyl cyanide d) Acetic anhydrides

145. Carboxylic acid is formed by the hydrolysis of an addition compound formed by reaction of Grignard's reagent with
a) ethanal b) methanal
c) carbon dioxide d) methyl cyanide

146. Which is formed, when benzonitrile is hydrolysed by dil. HC1 ?
a) Benzoic acid b) Benzaldehyde
c) Benzamide d) Benzoic unhydride

Acidic Nature

147. The acidic nature of carboxylic acid is due to
a) high degree of ionisation of acid
b) greater resonance stabilization of the acid
c) greater resonance stabilization of its anion
d) all of the above

148. Acidic character of carboxylic acid ____ with an molecular mass increases
a) sometime increases some time decreases
b) decreases
c) increases
d) none of the above

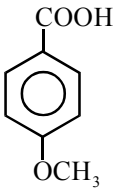
149. Among the acid

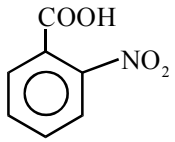
1) $HC \equiv C - COOH$ 2) $H_2C = CH - COOH$
3) $CH_3–CH_2–COOH$

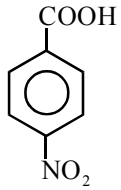
The acidic strength follows the order
a) $3 < 2 < 1$ b) $3 = 2 < 1$
c) $1 < 2 < 3$ d) $1 < 2 = 3$

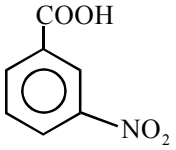
150. Which of the following is the most stable acid ?
a) $CH_2(F)COOH$ b) $CH_2(Br)COOH$
c) $CH_2(C1)COOH$ d) $CH_2(I)COOH$

151. Which of the following acid is strongest?
a) $CH_3–COOH$ b) $Cl_2–CH_2–COOH$
c) $C1_2CH–COOH$ d) $CCl_3–COOH$

152. Which of the following is weak acid ?
a) 

b) 

c) 

d) 

153. Which is the following is strongest acid ?
a) $CH_3CH_2CH_2COOH$
b) $CH_3CH_2CHBrCOOH$
c) $CH_3CHBrCH_2COOH$
d) $CH_2BrCH_2CH_2COOH$

154. Which of the following has highest Pka value ?
a) $C_6H_5–COOH$ b) CH–OH
c) $C_6H_5–OH$ d) $CH_3–COOH$

155. Which of the following is strong acid?
a) CF_3COOH b) $CC1_3COOH$
c) CBr_3COOH d) Cl_3COOH

156. Which of the following is strongest acid ?
a) H–COOH b) $C_6H_5–COOH$
c) $CH_3–COOH$ d) $CH_3CH_2–COOH$

157. Weakest acid among the following is
a) H–COOH
b) $C_6H_5–COOH$
c) $o–NO_2–C_6H_4–COOH$
d) CH_3 – COOH

158. Benzole acid is more stronger than all aliphatic carboxylic acid except H–COOH, why ?
a) C_6H_5–COOH is aromatic acid
b) In C_6H_5–COOH, the –COOH group is attached to sp^2-hydridised carbon atom
c) resonance stabilization of benzene ring
d) resonance stabilization of benzoate ion.

159. The aqueous solution of RCOOH contains,

a) $RCOO^- + H^+$

b) $RCO^+ + OH^-$

c) $RCOO^- + H_3O^+$

d) $RCOOH + RCOO^- + H_3O^+$

160. Which one of the following would be expected to be most highly ionised in water

a) $C1–CH_2–CH_2–CH_2–COOH$

b) $CH_3CHC1CH_2–COOH$

c) $CH_3–CH_2–CHC1–COOH$

d) $CH_3–CH_2–CH_2–COOH$

161. Between CH_3COOH and H–COOH, the HCOOH will be

a) less acidic b) more acidic

c) equally acidic d) non-acidic

162. Formic acid and acetic acid may be distinguished by the reaction with

a) sodium metal b) Tollen's reagent

c) sodium ethoxide d) NaOH

163. Which is tribasic acid

a) adipic acid b) succinic acid

c) citric acid d) tartaric acid

164. Consider the following acids

1) CH_3COOH 2) $C1_2CHCOOH$

3) $C1CH_2COOH$ 4) $C1_3CCOOH$

The correct sequence of acidity is

a) 1 > 4 > 3 > 2 b) 1 > 3 > 2 > 4

c) 1 > 2 > 3 > 4 d) 4 > 2 > 3 > 1

165. Which of the following order of relative strength of acid is correct ?

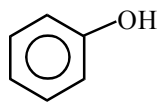
a) $F–CH_2–COOH > Cl\ CH_2\ COOH > Br–CH_2–COOH > CH_3COOH$

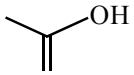
b) $CH_3COOH > F–CH_2–COOH > C1CH_2–COOH > CH_3Br–CH_2COOH$

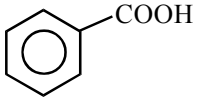
c) $BrCH_2COOH > C1–CH_2COOH > F–CH_2–COOH > CH_3COOH$

d) $C1CH_3COOH > FCH_9–COOH > BrCH_2–COOH$

166. Which of the following is weakest acid

a) 

b) 

c) H – COOH d) 

167. Which of the following acid has smallest dissociation constant ?

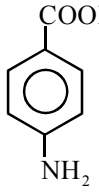
a) $CH_3–CHFCOOH$

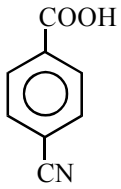
b) $BrCH_2CH_2–COOH$

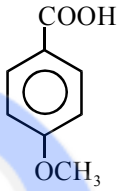
c) $F–CH_2–CH_2–COOH$

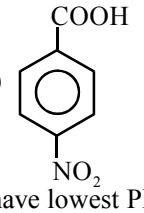
d) $CH_3–CHBr–COOH$

168. Which among the following is strongest acid ?

a) 

b) 

c) 

d) 

169. Among the acid which have lowest PKa value,

a) CH_3COOH

b) $CH_3–CH_2–COOH$

c) $CH_3 – \underset{\displaystyle NO_2}{\underset{|}{CH}} – COOH$

d) $CH_3 – \underset{\displaystyle COOH}{\underset{|}{CH}} – COOH$

170. The correct order of increasing strength of compounds

1) CH_3COOH 2) NO_2CH_2COOH

3) CF_3COOH 4) $C_2H_5–COOH$

a) 4 > 3 > 2 > 1 b) 3 > 2 > 1 > 4

c) 3 > 1 > 2 > 4 d) 3 > 4 > 2 > 1

171. Among the following acidic strength is

1) $CH_3–CH_2–COOH$

2) $CH_3 – \underset{\displaystyle CN}{\underset{|}{CH}} – COOH$

3) $CH_3 – \underset{\displaystyle Cl}{\underset{|}{CH}} – COOH$

4) $CH_3 – \underset{\displaystyle CO_2}{\underset{|}{CH}} – COOH$

a) 4 > 1 > 2 > 3 b) 3 > 4 > 2 > 1

c) 4 > 2 > 3 > 1 d) 4 > 3 > 2 > 1

Properties and Uses

172. $CH_3COOH + CH_3 \bullet H \xrightarrow{H^+} A\,(ester) + B\,(water)$

Alcohol contain isotopic oxygen (•). The isotopic oxygen will be in

a) $CH_3CO\bullet CH_3 + H_2O$

b) $CH_3COOCH_3 + H_2\bullet$

c) both are correct

d) none is correct

173. Select incorrect statement

a) NaOH is strong enough to remove the proton from phenols and carboxylic acids

b) $NaHCO_3$ is only strong enough to remove the proton of carboxylic acids

c) Mixture of phenol and carboxylic acid can be separated using $NaHCO_3$

d) Mixture of phenol and carboxylic acid can be separated using NaOH

174. What is the main reason for the fact that carboxylic acid can undergo ionization ?

a) Absence of alpha-hydrogen

b) Resonance stabilization of the carboxylate ion

c) High reactivity of alpha-hydrogen

d) Less reactivity of a-H atom

175. Tollen's reagent is reduced by

a) HCOOH b) CH_3COOH

c) $CH_2C1COOH$ d) $CC1_3COOH$

176. The end product of following sequence of reaction is

$$CH_3 - CHO \xrightarrow{[O]} A \xrightarrow{NH_3} B \xrightarrow{\Delta} C$$

a) CH_3COONH_4 b) CH_3CONH_2

c) CH_3COOH d) $CH_3–OH + N_2$

177. Toluene $\xrightarrow{KOH+KMnO_4} A \xrightarrow{PCl_5}$

$$B \xrightarrow{CH_3COONa} C$$

Product 'C' is

a) benzoic ethanoic unhydride

b) benzophenone

c) acetophenohe

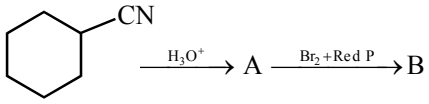
d) benzoquinone

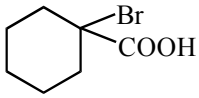
178. Propionic acid on bromination in the presence of red phosphorus gives 2-bromo propionic acids it shows

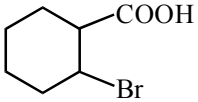
a) optical isomers b) tautomerism

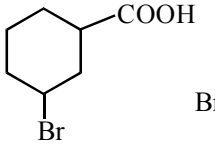
c) cis-trans isomers d) metamerism

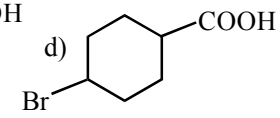
179. Product 'B' following reaction is



a) 

b) 

c) 

d) 

180. Which has maximum value of equilibrium constant?

a) $CF_3COOH + H_2O \rightleftharpoons CF_3COO^- + H_3O^+$

b) $HCOOH + H_2O \rightleftharpoons HCOO^- + H_3O^+$

c) $CH_3COOH + H_2O \rightleftharpoons CH_3–CHOO^- + H_3O^+$

d) $C_6H_5COOH + H_2O \rightleftharpoons C_6H_5–COO– + H_3O^+$

181. When propionic acid is heated with ammonia give,

a) CH_3CONH_2 b) $C_2H_5COONH_4$

c) $C_2H_5CONH_2$ d) CH_3COONH_4

182. Product 'A' and 'B' in the following reaction is

$$CH_3CH = CH_2 \xrightarrow{K_2Cr_2O_2 + dil.\ H_2SO_4} A + B$$

a) acetone

b) acetaldehyde and formaldehyde

c) propanoic acid

d) acetic acid and formic acid

183. Sodium acetate reacts with acetyl chloride to give

a) acetic acid b) acetic anhydride

c) methyl acetate d) ethyl acetate

184. Acetic acid react with $PC1_5$ gives

a) CH_3COC1 b) $C1CH_2CH_2C1$

c) CH_3COOCl d) CH_3Cl

185. Which of the following compound reacts with $NaHCO_3$ solution to give sodium salt and carbon dioxide ?

a) Phenol b) 1-propanol

c) Acetic acid d) Nitric acid

186. An optically active compound 'X' evolve CO_2 with $NaHCO_3$. The 'X' react with $LiAlH_4$ gives chiral compound. The compound 'X' is

a) $CH_3–CH_2–CH_2–CH_2–COOH$

b) $CH_3-\underset{\underset{COOH}{|}}{CH}-CH_2-CH_3$

c) $CH_3-CH_2-\underset{\underset{COOH}{|}}{CH}-CH_2-CH_3$

d) $CH_3-\underset{\underset{CH_2-OH}{|}}{CH}-CH_2-CH_3$

187. An propanoyl chloride is formed when $PC1_5$ reacts with an

a) prop anoic acid b) alcohol

c) acetic acid d) ester

188. Which of the following substance will give amide, when it reacts with NH_3?

a) CH_3X b) CH_3NH_2

c) CH_3COCl d) $(CH_3CO)_2O$

189. Formic acid is a stronger acid than acetic acid. This is due to the fact that

a) formic acid is reducing agent

b) formic acid molecule is of smaller size

c) there is no alkyl group on α-carbon in formic acid

d) formic acid does not undergo association

190. What are the product in the following reaction

$$CH_3-\underset{\underset{CH_3}{|}}{C}=CH_2 \xrightarrow[\text{dil. } H_2SO_4]{K_2Cr_2O_7}$$

a) $CH_3–COCH_3$ and H–COOH

b) $CH_3–CH_2CHO$ and CO_2

c) $CH_3–COOH$ and H–COOH

d) $CH_3–CHO$ and H–COOH

191. Product of the following reaction is

$$CH_3COCH_3 \xrightarrow{[O]} A \xrightarrow{PCl_3} B \xrightarrow{CH_3COONa} C$$

a) acetic unhydride

b) propanoic unhydride

b) propanoic unhydride

d) isopropyl alcohol

192. Which of the following does not under go HVZ reaction ?

a) $CH_3–COOH$

b) $CH_3–CH_2–COOH$

C) $CH_3–\underset{\underset{Cl}{|}}{CH}–COOH$

d) $(CH_3)_3C–COOH$

193. During formation of unhydride from P_2O_5 and acid. The acid molecule undergoes

a) intermolecular dehydration

b) interamolecular dehydration

c) oxidation

d) hydration

194. Acetic anhydride is obtained by the reaction of

a) sodium and acetic acid

b) ammonia and acetic acid

c) ethanol and acetic acid

d) P_2O_5 and acetic acid.

195. An ester is subjected to hydrolyse. Product of hydrolysis will be tested for

a) carboxylic acid and alcoholic group

b) carboxylic acid and ketonic group

c) carboxylic acid and aldehyde group

d) aldehyde and ketonic group

196. Carboxylic acid reacts with potassium metal. The amount of potassium used up and hydrogen liberated are in the molar ratio of

a) 2 : 1 b) 1 : 1

c) 3 : 2 d) 2 : 3

197. HVZ reaction is characteristic reaction of

a) α-H atom b) β-H atom

c) γ-H atom d) δ-H atom

198. Carboxylic acid reacts with calcium metal. The amount of calcium used up and hydrogen liberated are in the molar ratio of

a) 2 : 1 b) 1 : 1

c) 3 : 2 d) 2 : 3

199. Two molecules of acetic acid are heated with P_2O_5. The product formed is

a) two moles of ethanol

b) two moles of methyl cyanide

c) acetic anhydride

d) formic acid

200. Carboxylic acid can

a) decompose carbonate and evolve CO_2

b) reacts with metal forming H_2 gas

c) neutralise ammonium hydroxide form salt

d) all of the above

201. Which of the following group will increase more acidity of acetic acid ?

a) $-NO_2$ b) $-CH_3$

c) CH_3O^- d) $-NH_2$

202. P_2O_5 is anhydride of

a) H_3PO_3 b) HPO_3

c) H_3PO_4 d) HC1O

203. The solvent that can dissolve all the carboxylic acids is

a) water b) dil. HC1

c) dil. NaOH d) conc. H_2SO_4

204. Acetyl chloride can be prepared

a) by the action of CH_3COOH with chloroform

b) by the action of $PC1_3$ on acetic acid

c) by the action of $C1_2$ on acetic acid

d) by the action of $CC1_4$ on acetic acid

205. Of the following four reactions, formic and acetic acid differ in which respect ?

a) Formation of ester with alcohol

b) Replacement of hydrogen by sodium

c) Reduction of Fehling solution

d) Blue litmus reaction

206. Arrange the following carboxylic acid in their decreasing acidity

1. $\begin{matrix}COOH\\|\\COOH\end{matrix}$ Oxalic acid

2. $HOOC-CH_2-COOH$ Malonic acid

3. $\begin{matrix}CH_2-COOH\\|\\CH_2-COOH\end{matrix}$ Succinic acid

a) 3 > 2 > 1 b) 1 > 2 > 3

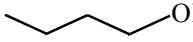
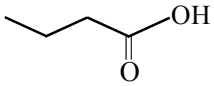
c) 2 > 3 > 1 d) 2 > 1 > 3

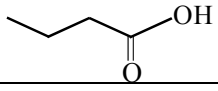
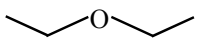
207. Among the following which compound will react with Na_2CO_3 solution to give sodium salt and CO_2?

a) Phenol b) 1-hexanol

c) Formic acid d) Ethanal

208. Identify the correct order of boiling point of following compound ?

1.  2. 

3.  4. 

a) 1 > 3 > 2 > 1 b) 2 > 3 > 1 > 4

c) 3 > 1 > 2 > 4 d) 3 > 1 > 4 > 2

209. The compounds formed by the acid hydrolysis of ethyl acetate are

a) formic acid and propanol

b) acetic acid and ethanol

c) acetone and ethanol

d) acetone and methanol

210. – COOH group of a compound does not react with $NaHSO_3$ even though it has > C = O group because of

a) cyclic structure b) acidic character

c) linear structure d) resonance

211. Final product of following reaction is

$$CO_2 + (CH_3)_3C-MgBr \xrightarrow[(ii)\ H_3O^+]{(i)\ \text{dry ether}} A \xrightarrow[\text{Red P}]{Br_2} B$$

a) $\begin{matrix}CH_3\\|\\CH_3-C-COOH\\|\\Br\end{matrix}$

b) $\begin{matrix}CH_3\\|\\CH_3-C-CH-COOH\\|\quad|\\CH_3\quad Br\end{matrix}$

c) $CH_3-CH_2-\underset{\displaystyle Br}{\underset{|}{CH}}-COOH$

d) No product will be formed.

212. Acids having higher B.P. than alcohols because of

a) intra molecular HB

b) dimerisation of acid

c) dipole-dipole attraction

d) Vander Waals force of attraction

213. Product of the following reaction is

$$CH_3-Cl + C_2H_5-COOAg \longrightarrow A \xrightarrow{H_3O^+} B$$

a) CH_3–COOH + C_2H_5–OH

b) CH_3–CHO + C_2H_5–OH

c) C_2H_5–COOH + CH_3–OH

d) C_2H_5–COOH + C_2H_5–OH

214. Adipic acid is formed by oxidation of

a) cyclohexane b) cyclohexene

c) hex-1-ene d) hex-2-ene

215. Product 'B'of the following

$$CH_3 - CH_2 - COOH + Cl_2 \xrightarrow{\text{Red P}} A \xrightarrow{\text{KOH alc.}} B$$

a) CH_3–CHC1–COOH
b) CH_3–CHOH–COOH
c) CH_2 = CH–COOH
d) CH ≡ C–COOH

216. Which of the following does not give HVZ reaction?

a) Acetic acid b) Propionic acid
c) Isobutyric acid d) Neovaleric acid

217. Product 'B' of the following

$$CH_3 - CH_2 - COOH + Br_2 \xrightarrow{\text{Red P}} \xrightarrow{\text{Aq. KOH}} B$$

a) CH_3–CH_2–CHOH–COOH
b) CH_3–CHOH–CH_2–COOH
c) HO–CH_2–CH_2–CH_2–COOH
d) CH_3–CH = CH–COOH

218. Terepnthalic acid is heated with ammonia gives

a) phthalamide b) phthalimide
c) isophthalic d) ammoniumphthalate

● ● ● ●

Answer Key

SECTION-I: ALDEHYDES AND KETONES

1.(a)	2.(b)	3.(b)	4.(c)	5.(c)	6.(c)	7.(c)	8.(b)	9.(b)	10.(b)
11.(b)	12.(c)	13.(a)	14.(c)	15.(d)	16.(b)	17.(c)	18.(d)	19.(d)	20.(b)
21.(d)	22.(b)	23.(d)	24.(b)	25.(c)	26.(d)	27.(b)	28.(c)	29.(a)	30.(b)
31.(d)	32.(c)	33.(b)	34.(b)	35.(b)	36.(b)	37.(c)	38.(d)	39.(b)	40.(b)
41.(a)	42.(b)	43.(c)	44.(b)	45.(a)	46.(c)	47.(d)	48.(a)	49.(a)	50.(c)
51.(c)	52.(a)	53. (b)	54.(c)	55.(c)	56.(d)	57.(a)	58.(d)	59.(b)	60.(a)
61.(b)	62.(a)	63.(d)	64.(c)	65.(b)	66.(b)	67.(b)	68.(d)	69.(c)	70.(a)
71.(c)	72.(a)	73.(c)	74.(b)	75.(d)	76.(c)	77.(b)	78.(a)	79.(a)	80.(c)
81.(a)	82.(c)	83.(c)	84.(a)	85.(d)	86.(c)	87.(d)	88.(a)	89.(a)	90.(b)
91.(d)	92.(b)	93.(b)	94.(b)	95.(d)	96.(d)	97.(b)	98.(d)	99.(b)	100.(a)
101.(c)	102.(a)	103.(c)	104.(b)	105.(c)	106.(d)	107.(a)	108.(b)	109.(d)	110.(c)
111.(d)	112.(c)	113.(c)	114.(a)	115.(b)	116.(b)	117.(b)	118.(d)	119.(d)	120.(a)
121.(a)	122.(b)	123.(b)	124.(d)	125.(c)	126.(c)	127.(c)	128.(b)	129.(b)	130.(d)
131.(b)	132.(b)	133.(d)	134.(c)	135.(d)	136.(c)	137.(d)	138.(c)	139.(a)	140.(a)
141.(a)	142.(b)	143.(a)	144.(c)	145.(c)	146.(d)	147.(c)	148.(c)	149.(c)	150.(b)
151.(a)	152.(b)	153. (a)	154.(d)	155.(b)	156.(a)	157.(b)	158.(b)	159.(c)	160.(d)
161.(c)	162.(a)	163.(b)	164.(c)	165.(c)	166.(d)	167.(d)	168.(b)	169.(d)	170.(d)
171.(d)	172.(d)	173.(d)	174.(a)	175.(a)	176.(b)	177.(a)	178.(d)	179.(b)	180.(a)
181.(a)	182.(a)	183.(c)	184.(c)	185.(a)	186.(c)	187.(d)	188.(a)	189.(d)	190.(b)
191.(b)	192.(c)	193.(b)	194.(d)	195.(d)	196.(b)	197.(b)	198.(d)	199.(b)	200.(d)
201.(c)	202.(b)	203.(b)	204.(b)	205.(d)	206.(b)	207.(b)	208.(c)	209.(b)	210.(b)
211.(c)	212.(b)	213.(b)	214.(b)	215.(d)	216.(c)	217.(b)	218.(a)	219.(b)	220.(c)
221.(b)	222.(c)	223.(d)	224.(c)	225.(b)	226.(c)	227.(a)	228.(d)	229.(a)	230.(d)
231.(a)	232.(d)	233.(c)	234.(d)	235.(d)	236.(b)	237.(c)	238.(c)	239.(b)	240.(a)
241.(a)	242.(c)	243.(d)	244.(b)	245.(c)	246.(c)	247.(c)	248.(c)	249.(c)	250.(d)
251.(b)	252.(a)	253. (b)	254.(c)	255.(c)	256.(b)	257.(d)	258.(d)	259.(a)	260.(b)
261.(c)	262.(d)	263.(c)	264.(d)	265.(a)	266.(d)	267.(c)	268.(a)	269.(b)	270.(c)
271.(c)	272.(a)	273.(b)	274.(c)	275.(a)	276.(d)	277.(a)	278.(a)	279.(b)	280.(d)
281.(b)	282.(c)	283.(c)	284.(b)	285.(c)	286.(d)	287.(b)	288.(c)	289.(d)	290.(b)
291.(b)	292.(d)	293.(a)	294.(a)	295.(c)	296.(d)	297.(d)	298.(a)	299.(c)	300.(c)

Answer Key

SECTION-I: ALDEHYDES AND KETONES

301.(d)	302.(d)	303.(b)	304.(c)	305.(a)	306.(d)	307.(d)	308.(b)	309.(b)	310.(a)
311.(b)	312.(b)	313.(c)	314.(c)	315.(c)	316.(a)	317.(b)	318.(b)	319.(b)	320.(a)
321.(a)	322.(a)	323.(b)	324.(b)	325.(c)	326.(a)	327.(b)	328.(a)	329.(b)	330.(d)
331.(c)	332.(a)	333.(a)	334.(d)	335.(c)	336.(a)	337.(b)	338.(b)	339.(d)	340.(a)
341.(c)	342.(c)	343.(c)	344.(a)	345.(a)	346.(b)	347.(d)	348.(b)	349.(b)	350.(a)
351.(b)	352.(a)	353. (b)	354.(c)	355.(b)	356.(a)	357.(b)	358.(a)	359.(b)	360.(c)
361.(b)	362.(d)	363.(d)	364.(b)	365.(c)	366.(a)	367.(b)	368.(a)	369.(c)	370.(c)
371.(a)	372.(b)	373.(b)	374.(a)	375.(b)	376.(b)	377.(b)			

SECTION-II: CARBOXYLIC ACIDS

1.(b)	2.(c)	3.(a)	4.(b)	5.(c)	6.(a)	7.(c)	8.(c)	9.(d)	10.(a)
11.(b)	12.(d)	13.(b)	14.(c)	15.(b)	16.(c)	17.(a)	18.(b)	19.(b)	20.(c)
21.(c)	22.(d)	23.(c)	24.(c)	25.(a)	26.(b)	27.(c)	28.(d)	29.(b)	30.(c)
31.(c)	32.(b)	33.(b)	34.(a)	35.(a)	36.(c)	37.(d)	38.(c)	39.(d)	40.(b)
41.(a)	42.(a)	43.(b)	44.(a)	45.(a)	46.(a)	47.(b)	48.(b)	49.(d)	50.(b)
51.(c)	52.(d)	53. (a)	54.(a)	55.(a)	56.(c)	57.(b)	58.(b)	59.(b)	60.(c)
61.(d)	62.(b)	63.(b)	64.(b)	65.(c)	66.(c)	67.(a)	68.(b)	69.(b)	70.(b)
71.(d)	72.(a)	73.(d)	74.(d)	75.(b)	76.(a)	77.(a)	78.(d)	79.(b)	80.(b)
81.(b)	82.(b)	83.(d)	84.(b)	85.(d)	86.(a)	87.(d)	88.(b)	89.(a)	90.(c)
91.(a)	92.(c)	93.(c)	94.(c)	95.(c)	96.(c)	97.(c)	98.(c)	99.(d)	100.(c)
101.(c)	102.(a)	103.(c)	104.(d)	105.(c)	106.(a)	107.(d)	108.(d)	109.(c)	110.(a)
111.(c)	112.(b)	113.(c)	114.(c)	115.(d)	116.(d)	117.(b)	118.(c)	119.(c)	120.(c)
121.(a)	122.(d)	123.(c)	124.(d)	125.(b)	126.(c)	127.(a)	128.(a)	129.(c)	130.(a)
131.(a)	132.(a)	133.(a)	134.(d)	135.(c)	136.(b)	137.(a)	138.(c)	139.(a)	140.(a)
141.(c)	142.(a)	143.(d)	144.(b)	145.(c)	146.(a)	147.(c)	148.(b)	149.(a)	150.(d)
151.(d)	152.(a)	153. (b)	154.(b)	155.(a)	156.(a)	157.(d)	158.(b)	159.(d)	160.(c)
161.(b)	162.(b)	163.(d)	164.(d)	165.(a)	166.(a)	167.(b)	168.(d)	169.(c)	170.(b)
171.(c)	172.(a)	173.(d)	174.(b)	175.(a)	176.(b)	177.(a)	178.(a)	179.(a)	180.(a)
181.(c)	182.(d)	183.(b)	184.(a)	185.(c)	186.(b)	187.(a)	188.(c)	189.(c)	190.(a)
191.(a)	192.(d)	193.(a)	194.(d)	195.(a)	196.(a)	197.(a)	198.(b)	199.(c)	200.(d)
201.(a)	202.(b)	203.(c)	204.(b)	205.(c)	206.(b)	207.(c)	208.(c)	209.(b)	210.(d)
211.(d)	212.(b)	213.(c)	214.(b)	215.(c)	216.(d)	217.(a)	218.(b)		


DGT

EXPLANATIONS

39. Ketone also shows tautomerism by transfer of hydrogen.

$$CH_3-CO-CH_2H \rightleftharpoons CH_3-\overset{OH}{\underset{|}{C}}=CH_2$$

ketoform (stable) enolform (less stable)

58. We know that

$$(HCOO)_2Ca \xrightarrow{\Delta} HCHO + CaCO_3$$

Thus in this reaction, formaldehyde (HCHO) is produced.

59. $RCN+RMgX \xrightarrow[H_3O^+]{\text{dryether}} RCOR + NH_3+MgXOH$

60. $CH_3CCl_2CH_3 + 2KOH \xrightarrow{aq.} CH_3COCH_3 + 2KCl$

61. $CH_3CCl_2CH_2CH_3 + 2KOH \xrightarrow{aq.}$

$CH_3COCH_2CH_3 + 2\,KCl$

62. $CH_3CHOHCH_3 \xrightarrow{\text{oxidation}} CH_3COCH_3 + H_2O$

69. Molecular formula $C_4H_{10}O$ has four isomers i.e. n-butyl alcohol, isobutyl alcohol, sec. butyl alcohol, t-butyl alcohol. Sec. butyl alcohol is optically active and on oxidation gives ethyl methyl ketone.

$$CH_3CHOHC_2H_5 \xrightarrow{\text{oxidation}} CH_3COC_2H_5 + H_2O$$

71. $HCN + (CH_3)_2CHMgX \xrightarrow[H_3O^+]{\text{dry ether}}$

$(CH_3)_2CH-CHO + MgXOH$

119. The reagents *a, b, c* reacts with the carbonyl compounds in a same manner and only NH_3 react differently. Formaldehyde is reacted with ammonia give urotropine. Acetaldehyde reacts ammonia give acetaldehyde amine and acetone reacts ammonia give diacetone amine.

120. Positive charge on carbonyl carbon is maximum in case of HCHO. It is because no alkyl group (+I effect) is attached with it and therefore, positive charge is not dispersed. Hence formaldehyde is more reactive than other aldehydes

121. Aldehydes are more reactive than ketones towards nucleophilic addition reactions, due to the electron repelling inductive effect (+I) of alkyl groups. The alkyl groups at the carbonyl carbon in ketones reduces the positive charge over it and therefore, the tendency of a nucleophilic attack is reduced. The bulky alkyl groups also decrease the reactivity of >C=O group, due to steric hindrance.

122. Aldehydes and ketones both have carbonyl group >C=0, which reacts with Grignard's reagent. Fehling's solution gives red precipitate or coloration with aldehydes only, except aromatic aldehydes. Tollen's reagent gives silver mirror only with aldehydes. Only, aldehydes turn Schiff's reagent pink.

123. Aldehydes lacking an α hydrogen undergoes self oxidation reduction (disproportionation reaction), also known as Cannizzaro's reaction.

124. Cannizzaro's reaction is given by those aldehydes which have no α hydrogen atom. Compound (*a*) has no α hydrogen atoms, so it shows Cannizzaro's reaction. Compound (*b*) has no α-hydrogen atom but does not show Cannizzaro's reaction, because of -I effect.

125. This is aldol condensation reaction

$CH_3CH_2CH_2CHO + CH_3CH_2CH_2CHO$

$\xrightarrow{\text{dil.NaOH}} CH_3CH_2CH_2CHOHCH(C_2H_5)CHO$

2-ethyl 3-hydroxy hexanal

126. $2HCHO + KOH \longrightarrow CH_3OH + HCOOK$

127. The nucleophile is SO_3^{--} not HSO_3^-, SO_3Na

128. The nucleophile is CN^- attack on $>C^{\delta+}$

129. $CH_3COCH_3 + CH_3MgI \xrightarrow[H_3O^+]{\text{dryether}}$

$(CH_3)_3COH + MgIOH$

130. Aldol condensation reaction shown by those aldehydes and ketones containing α hydrogen atoms or aldehydes and ketones having methyl or methylene group in α position.

131. This is aldol condensation reaction

$CH_3CH_2CHO + CH_3CH_2CHO \xrightarrow{\text{dil.NaOH}}$

$CH_3CH_2CHOHCH(CH_3)CHO$

2-methyl 3-hydroxy pentanal

132. When aldehydes condenses with ketone, produces four condensation products. It is the α-hydrogen atom of the ketone which is involved in the condensation reaction and produces major product.

$CH_3CHO + HCH_2COCH_3 \xrightarrow{\text{dil.NaOH}}$

$CH_3CH(OH)CH_2COCH_3$

4-hydroxy 2-pentanone

133. Iodoform test is given by organic compounds which contains CH_3CO group or CH_3CHOH grouping. 3-pentanone does not contain any one of such grouping.

134. Methyl ketones react with iodine and aqueous alkali to form yellow compound, iodoform (CHI_3)

135. Compounds a, b, c undergoes nucleophilic addition reactions. Hence, RMgX adds in above compounds.

136. Ketones do not respond to Tollen's test. Aldehydes respond to Tollen's test.

137. Fehling solution is weak oxidising agent and benzaldehyde is weak reducing agent. Hence, it does not react with Fehling solution. Formic acid, glucose, ethanal contains CHO-group. Hence, they reduce Fehling solution.

138. $RCOR + RMgX \xrightarrow[H_3O^+]{\text{dryether}} R_3C\text{–}OH + MgXOH$

139. $(CH_3)_2C = O + H_2CHCOCH_3 \xrightarrow{NH_3}$

$(CH_3)_2C = CHCOCH_3 + H_2O$

140. $>C=O + 4H \xrightarrow{Zn(Hg) + HCl} >CH_2 + H_2O$

141. Self redox reaction is Cannizzaros not given by those aldehydes which contain α-hydrogen atoms. Methanal does not have α-hydrogen atoms, hence, it give self redox reaction.

142. $6HCHO + 4NH_3 \longrightarrow (CH_2)_6N_4 + 6H_2O$

143. When aldehydes condenses with ketone, gives four condensation products. It is the α-hydrogen atom of the ketone which is involved in the condensation reaction and produces major product.

$CH_3CH_2CHO + HCH_2COCH_3 \xrightarrow{dil.NaOH}$

$CH_3CH_2CH(OH)CH_2COCH_3$

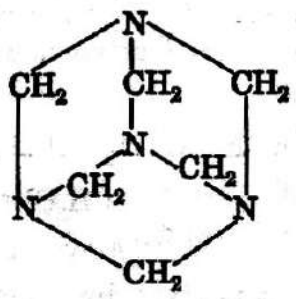
5-hydroxy 2-hexanone

144. This is aldol condensation reaction,

$CH_3COCH_3 + CH_3COCH_3 \xrightarrow{Ba(OH)_2}$

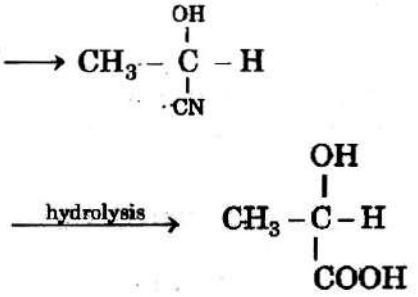
$CH_3C(OH)(CH_3)CH_2COCH_3$

145. Structure of urotropine is,



146. Acetone and acetaldehyde, both contains >C=0 group. The Grignards adds in >C=0 group. These are nucleophilic substitution reaction.

147.



lactic acid (optically active acid)

148. We know that,

$2CuO + CH_3CHO \longrightarrow Cu_2O\downarrow + CH_3COOH.$

Thus when ethanal (CH_3CHO) is heated with Fehling's solution, it gives a red precipitate of cuprous oxide (Cu_2O).

169. We know that in aldol condensation, α-hydrogen atoms undergo self-addition between two molecules to form β-hydroxy ketone. Therefore ketone in which α-hydrogen atom is present, give this reaction.

170. We know that,

$2HCHO + KOH \xrightarrow{\Delta} HCOOK + CH_3OH$

Thus in this reaction, methyl alcohol (CH_3OH) is produced. This reaction is known as Cannizzaro's reaction.

171. We know that benzaldehyde which does not contain α-hydrogen atom, undergoes self oxidation-reduction when reacted with 50% aqueous alkali. In the process of converting benzaldehyde to benzly alcohol, one molecule is oxidesed to sodium benzoate at the expense of other which is reduced to benzyl alcohol. This reaction is known as Cannizzaro's reaction.

172. We know that aldehyde can be oxidised with potassium dichromate ($K_2Cr_2O_7$) in acidic medium to form carboxylic acid, when Tollens reagent is used to oxidise an aldehyde, the silver ion is reduced to metallic form if the reaction is carried out in a clean test tube. We also know that when Fehling's solution is used to oxidise an aldehyde, the complex cupric ion is reduced to cuprous oxide. Therefore all of these options are correct.

173. We know that,

$6HCH = O + 4NH_3 \longrightarrow (CH_2)_6N_4 + 6H_2O.$

Formaldehyde — Hexamethylene tetramine

Thus in this reaction, the product Y is hexamethylene tetramine [$(CH_2)_6N_4$]

174. We know that, aldehyde restores the colour of Schiff's reagent in the cold, while ketones do not give this test.

EXPLANATIONS

18. $C_2H_4O_2$ have two isomers,
(*i*) CH_3COOH, (*ii*) $HCOOCH_3$

52. $CH_3CH_2CH_2Br \xrightarrow[\text{dry ether}]{Mg} CH_3CH_2CH_2MgBr$

$\xrightarrow[\text{dry ether}]{CO_2/H_3O^+} CH_3CH_2CH_2COOH$

53. $CO_2 + RMgX \xrightarrow[H_3O^+]{\text{dry ether}} RCOOH + MgXOH$

54. Carbonation of CH_3MgI forms CH_3COOH. Hydrolysis of acetonitrile by a mineral acid also forms CH_3COOH.

55. $CH_3CH_2CH_2OH + CH_3CH_2COOH$

$\xrightarrow{Conc.\ H_2SO_4} CH_3CH_2COOCH_2CH_2CH_3$

propyl propionate

56. $(CH_3CO)_2O + CH_3OH \xrightarrow{\Delta}$

$CH_3COOH + CH_3COOCH_3$

mol. mass 74

$(HCO)_2O + C_2H_5OH \xrightarrow{\Delta} HCOOH + HCOOC_2H_5$

mol. mass 74

60. $CH_3COOH + (CH_3)_2CHOH \xrightarrow{conc.\ H_2SO_4}$

$CH_3COOCH(CH_3)_2 + H_2O$

61. $C_2H_5COOH + CH_3OH \xrightarrow{pyridine}$

$C_2H_5COOCH_3 + H_2O$

62. $C_2H_5COOAg + C_2H_5I \xrightarrow{\Delta} AgI + C_2H_5COOC_2H_5$

ethyl propionate

64. We know that,

$CH_3COOH + C_2H_5OH \rightarrow CH_3COOC_2H_5 + H_2O.$

Thus in this reaction, an ester ($CH_3COOHC_2H_5$) is formed. This process is called esterfication.

65. We know that,

$RCH_2CH_2OH \xrightarrow{Oxidation} RCH_2COOH.$

66. $RCOOR' + H_2\dot{O} \underset{\Delta}{\overset{conc.\ H_2SO_4}{\rightleftharpoons}} RCO\dot{O}H + R'OH$

The radioactive oxygen must be in acid. This technique is known as tracer technique.

150. Electron withdrawing groups or atoms increase the strength of acid. More the electron withdrawing power, more the strength of acid.

In halogens electron withdrawing power is,

$F > Cl > Br > I.$

Hence, CH_2ICOOH is stable acid.

153. Strength of acid depends upon distance between electron withdrawing group and COOH group. Distance between electron withdrawing group and COOH group increases, the strength of the acid decreases.

164. Inductive effect diminishes with increases in the number of σ-bonds through which the effect operates. This makes $ClCH_2COOH$ more acidic than $ClCH_2CH_2COOH$. An electronegative atom Cl is an electron withdrawing group and acid strengthened. Therefore, $ClCH_2COOH$ is a stronger acid than CH_3COOH. Two chlorine atoms are more electron withdrawing than single Cl atom. So, $Cl_2CHCOOH$ is stronger acid than $ClCH_2COOH$.

172. Molecular formula $C_4H_8O_2$ is acids and esters. The compound react with CH_3MgI means it must be ester. The ester gives 2-propanol with excess CH_3MgI, it means that ester is formate ester.

174. $RCOOH + H_2O \longrightarrow RCOO^- + H_3O^+$

Because of resonance stabilization of carboxylate ion, the equilibrium shifts in the forward direction, thereby forming more and more of hydronium ions.

175. Formic acid has aldehydic group H–C=O, therefore reduces Tollen's reagent to give silver mirror test.

176. $HCOOC_2H_5 + CH_3MgI \xrightarrow[H_3O^+]{\text{dry ether}}$

$CH_3CHO + MgIOH + C_2H_5OH$

$CH_3CHO + CH_3MgI \xrightarrow[H_3O^+]{\text{dry ether}}$

$MgIOH + CH_3CHOHCH_3$

177. Carboxylic acids are weak acids, they dissociate lesser extent in water and equilibrium is shifted to left. Hence, aqueous solution of carboxylic acids contains undissociated acid molecules.

178. $CH_3–CH_2–COOH + Br_2 \xrightarrow{Red\ P}$

$CH_3–CHBr–COOH$

It shows optical isomerism.

181. $C_2H_5COOH + NH_3 \longrightarrow C_2H_5COONH_4$

$C_2H_5COONH_4 \xrightarrow{\Delta} C_2H_5CONH_2 + H_2O$

183. $\underset{\text{sod. acetate}}{CH_3COONa} + \underset{\text{acetyl chloride}}{CH_3COCl} \longrightarrow (CH_3CO)_2O + NaCl$

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

186. We know that,

$CH_3COOH + NaHCO_3 \longrightarrow$

$CH_3COONa + CO_2 + H_2O.$

Thus in this reaction acetic acid (CH_3COOH) reacts with $NaHCO_3$ to give sodium salt and carbon dioxide.

187. We know that,

$3CH_3COOH + PCl_5 \longrightarrow 3CH_3COCl + POCl_3 + HCl.$

Thus in this reaction PCl_5 react with an acetic acid (CH_3COOH) to produce acetyl chloride.

188. We know that,

$CH_3COCl + 2NH_3 \longrightarrow CH_3COONH_2 + HCl.$

Thus in this reaction, acetyl chloride (CH_3COCl) when heated with ammonia (NH_3) produces acetamide (CH_3CONH_2).

189. Electron donating alkyl groups decrease the strength of acid. That is why formic acid is strongest acid than acetic acid.