



**Ranjan Singh**  
**Chemistry Classes**

JEE (Main & Advanced) • NEET • XI • XII

*Study Package*



**Ranjan Singh**

**M.Sc. Bio-Chemistry (P.U)**

Ex-Faculty : Narayana & Goal

# ORGANIC CHEMISTRY

**ALDEHYDE, KETONE &  
CARBOXYLIC ACID**



## Director's Message



**Ranjan Singh**  
M.Sc.(Biochemistry), P.U.

Chemistry plays a central and important role in all competitive examinations as well as in day to day life. For last so many years, I have constantly been in touch with students, guiding them in Chemistry and looking into their difficulties for them to succeed in their board as well as competitive examinations (JEE(Mains & Advance) | NEET).

I have felt a need for a good coaching centre to fulfil the requirements of students. Students need a highly experienced and qualified faculty in chemistry, who can guide them well, clear their doubts, provide them the effective & tricky notes, and make them do much needed practice. More importantly they should also be provided Classroom Monitoring, Periodical & Surprise Tests to guide them in the proper direction. I realize that, it is very important to diagnose the basic weaknesses and problems of students not succeeding in JEE(Mains & Advance) | NEET and Board exams. In fact, as question patterns are changing, now they need to have a different approach for these Examinations.

At RANJAN SINGH CHEMISTRY CLASSES, we have our own way to prepare students for Competitive Examinations as well as Board Examination at a time so they can crack the entrance exam like JEE(Mains & Advance) and NEET as well as 12th Board simultaneously. We act as a medium to provide the simplest, easiest and a comfortable way to make students achieve their target. At RANJAN SINGH CHEMISTRY CLASSES(RSCC), we guide our students with the best motivational classes so weak students are also able to believe that, They can do it.

When you join RANJAN SINGH CHEMISTRY CLASSES you become a part of the powerful force which propels you towards your goal and if you get a position among the rankers with my excellent guidance, I will think that our efforts have borne fruits.

**M.Sc(Biochemistry), P.U.**

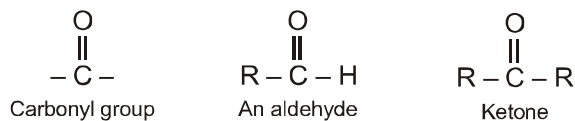
**Ex-faculty : Narayana IIT Academy**

**& Goal Institute**

*Ranjan Singh*

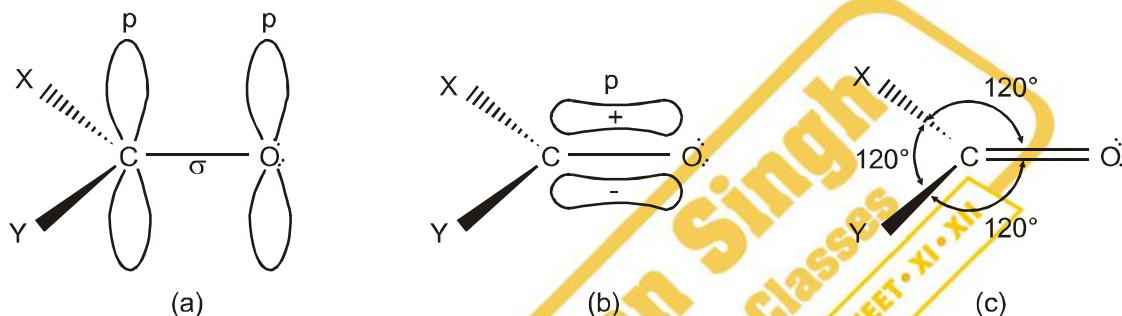
## CARBONYL COMPOUNDS (ALDEHYDES AND KETONES)

Aldehydes and ketones are the compounds containing carbonyl group ( $>C=O$ ).

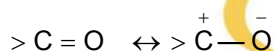


**Structure of the carbonyl group:** Like the carbon-carbon double bond of alkenes, the carbon-oxygen double bond of the carbonyl group is composed of one  $\sigma$  and one  $\pi$  bond.

In the carbonyl group, carbon atom is in state of  $sp^2$  hybridisation. The C–O  $\sigma$  bond is produced by overlap of an  $sp^2$  orbital of carbon with a p-orbital of oxygen. On the other hand, the C–O  $\pi$  bond is formed by the sideways overlap of p orbitals of carbon and that of p orbital of oxygen. The remaining two  $sp^2$  orbitals of carbon form  $\sigma$  bonds with the s orbital of hydrogen or  $sp^3$  orbital of carbon of the alkyl group.



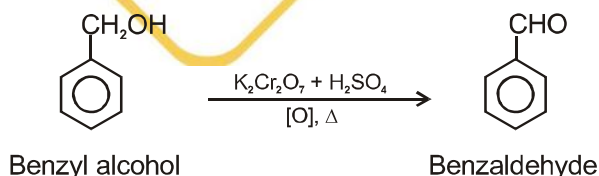
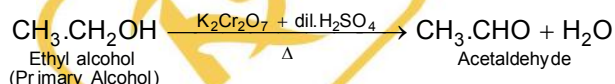
The polar nature of the carbonyl group causes intermolecular attraction (dipole-dipole attraction) in aldehydes and ketones and hence accounts their higher boiling points than that of hydrocarbons and ethers of comparable mol. wt. However, the high values of dipole moments (2.3 - 2.8 D) of aldehydes and ketones can't be accounted for, only by inductive effect; this can be accounted for if carbonyl group is a resonance hybrid of the following two structures.



## GENERAL METHODS OF PREPARATION OF ALDEHYDES AND KETONES

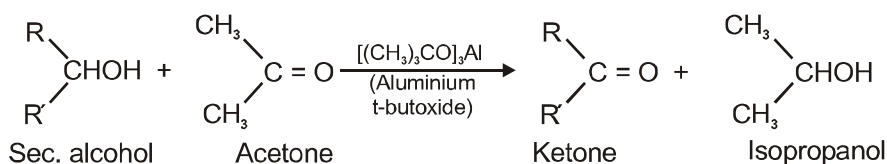
### 1. From Alcohols :

(i) **By Oxidation** : Primary alcohols gives aldehydes, while secondary alcohols give ketones.

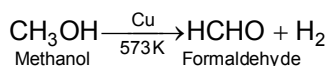


Controlled oxidation of  $1^\circ$ -alcohol and  $2^\circ$ -alcohol with PCC +  $\text{CH}_2\text{Cl}_2$  or  $\text{CrO}_3$  forms aldehyde and ketone respectively.

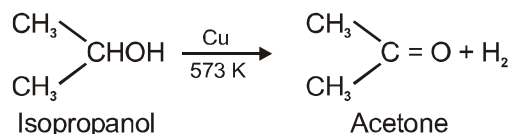
Ketones in good yield can be prepared by **Oppenauer oxidation of secondary alcohols**.



(ii) **By catalytic dehydrogenation of alcohols** : 1° Alcohols yield aldehyde in this method.



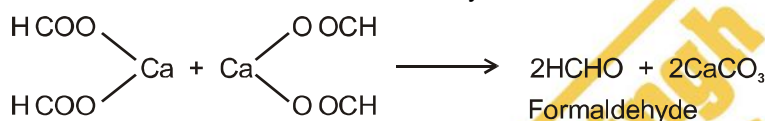
Secondary alcohols, on similar treatment, give ketones.



## 2. From Fatty Acids :

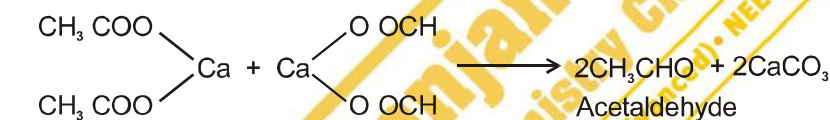
**By dry distillation of calcium salts of fatty acids** : Pyrolysis (heating) of calcium salts of fatty acid or a mixture of two fatty acids leads to the formation of aldehydes and/or ketones depending upon the nature of the fatty acid.

(a) Distillation of calcium formate to formaldehyde



Calcium formate (2 moles)

(b) Distillation of mixture of  $\text{Ca}(\text{CH}_3\text{COO})_2$  and  $\text{Ca}(\text{HCOO})_2$

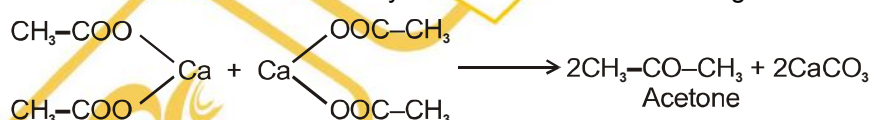


Calcium acetate

Calcium formate

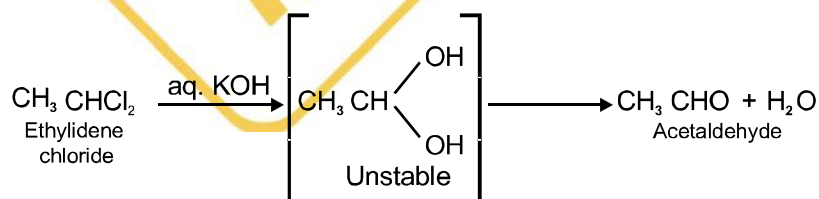
Yield is generally poor due to side reactions ; i.e., formaldehyde from calcium formate and acetone from calcium acetate.

(c) Distillation of the calcium salt of a fatty acid other than formic acid gives ketones (simple ketones).

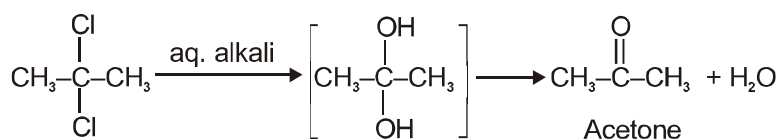


Calcium acetate

## 3. From gem-dihalides :

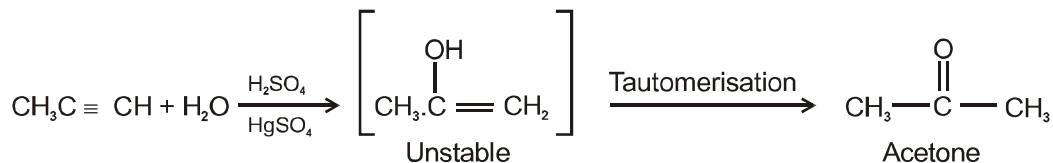
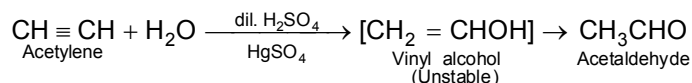


*gem*-Dihalides having two halogen atoms to a non-terminal carbon atom give ketone on alkaline hydrolysis.

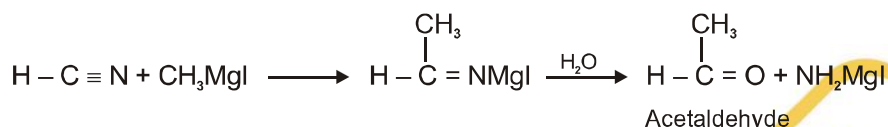


2, 2-Dichloropropane  
(Isopropylidene chloride)

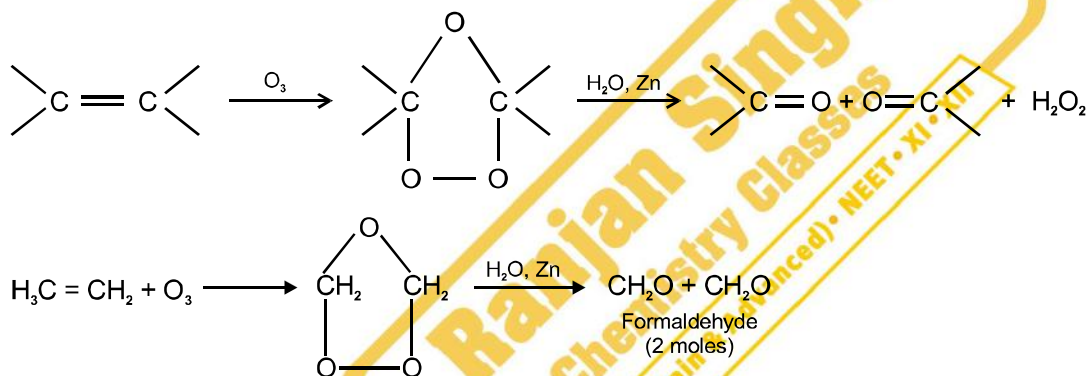
**4. From Alkynes :**



**5. From Grignard Reagents :**

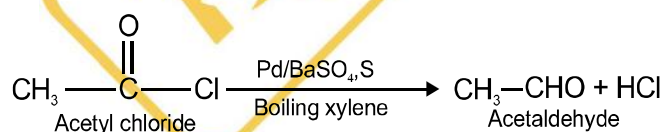
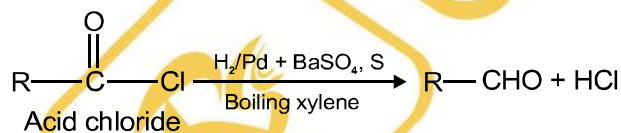


**6. By Reductive Ozonolysis of Alkenes :**

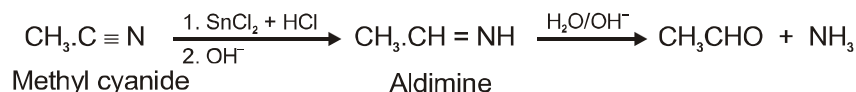


**7. Methods giving only Aldehydes :**

**(a) From Acid Chlorides (Rosenmund Reduction) :**

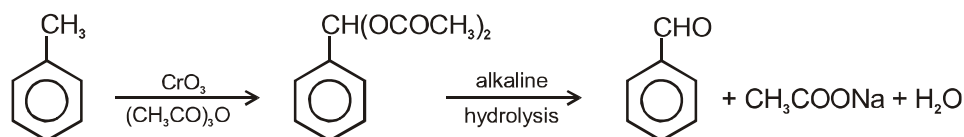


**(b) From nitriles (Stephen's reduction) :**

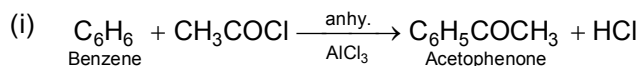


**8. Methods for Aromatic Aldehydes and Ketones :**

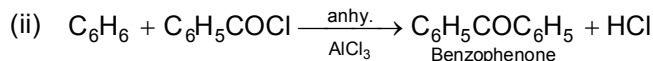
**(a) Aromatic Aldehydes :**



**(b) Aromatic Ketones : (Friedel-craft's acylation)**



Here instead of acid chloride we can use anhydrides also



**Physical Properties**

Methanal is gas at room temperature, ethanal is liquid at room temperature. Other carbonyl compounds are liquids or solids at room temperature.

Lower members have sharp pungent odours. As the size of the molecule increases, the odour becomes less pungent and more fragrant.

They can form H-bonding with water that's why lower members are miscible with water. With the increase in the size of the alkyl group their solubility in water decreases. However higher members are soluble in non polar organic solvents.

Their boiling point is greater than comparable molecular weight of hydrocarbon or ether because of their polarity but less than alcohol because alcohol has H-bonding.

**Trend of Boiling Point :**



**Chemical Properties**

Both aldehydes and ketones contain a carbonyl group in the structure and hence show marked similarity in their chemical behaviour.

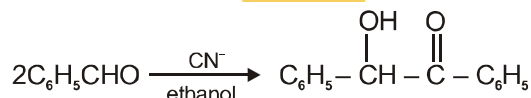
**(a) Nucleophilic addition reactions**

Aldehydes are more reactive than ketones because greater the alkyl group (as in ketone) more will be electron density and hindrance hence lesser will be chance for the attack of nucleophile and hence lesser will be ease of nucleophilic addition.

**(1) Addition of hydrogen cyanide :** Aldehydes and ketones react with hydrogen cyanide to form cyanohydrins.



Benzophenone does not react with hydrogen cyanide because of steric hindrance. On the other hand, aromatic aldehydes (e.g.,  $\text{C}_6\text{H}_5\text{CHO}$ ) when refluxed with alcoholic potassium cyanide solution undergo dimerization to form benzoin.

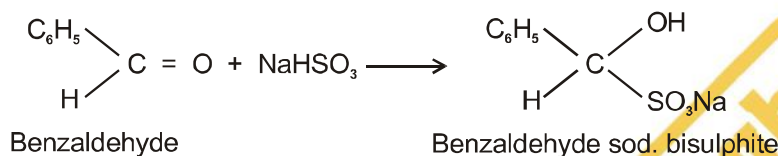
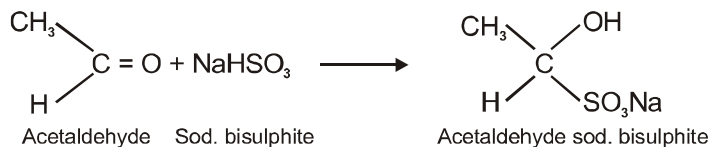


Benzaldehyde

Benzoin

Above reaction is known as benzoin condensation.

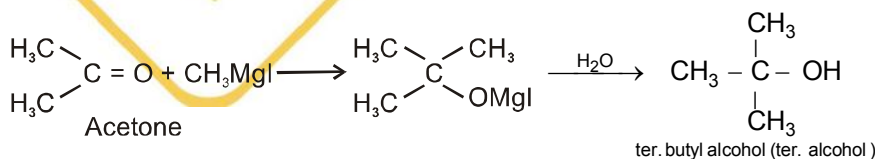
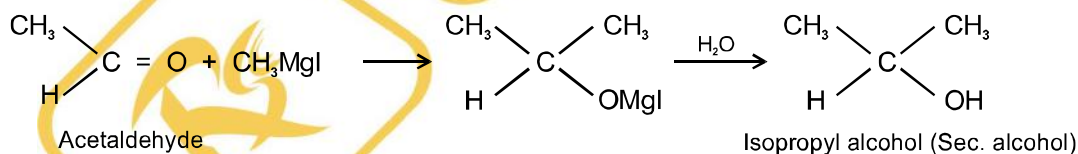
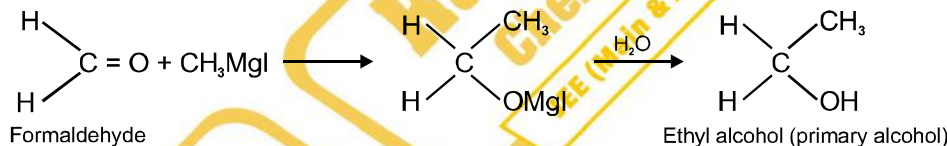
- (2) **Addition of sodium bisulphite** : Aldehydes and methyl ketones react with a saturated aqueous solution of bisulphite to form crystalline sodium bisulphite derivatives.



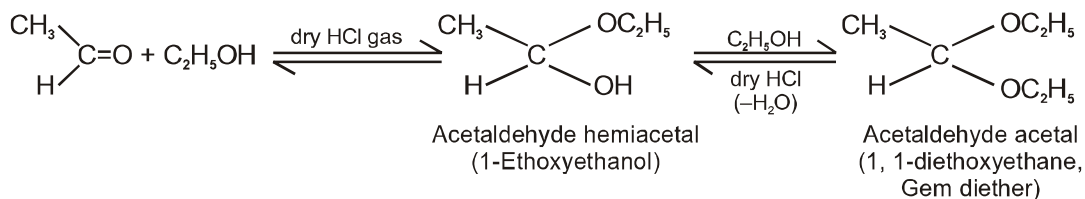
Aromatic ketones and aliphatic ketones having higher alkyl groups do not react with sodium bisulphite. This is due to the fact that the large  $\text{SO}_3^{2-}$  ion cannot attack the carbonyl carbon atom when it is surrounded by larger substituents (steric hindrance).

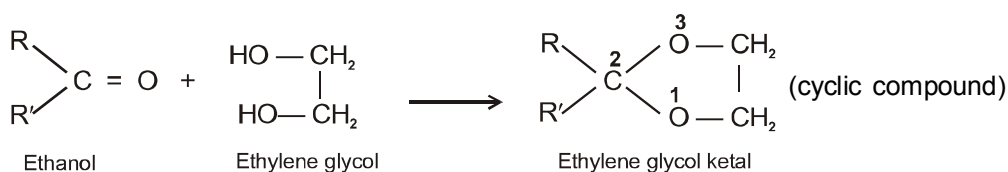
Thus  $\text{C}_2\text{H}_5\text{COC}_2\text{H}_5$ ,  $\text{C}_6\text{H}_5\text{COCH}_3$ ,  $\text{C}_6\text{H}_5\text{COC}_6\text{H}_5$  do not react with sodium bisulphite. Methyl ketones give this reaction.

- (3) **Addition of Grignard reagents** :

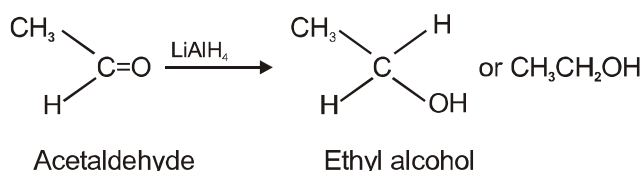


- (4) **Addition of alcohols** (Acetal formation) : Aldehydes (not Ketones) react with alcohols in presence of dry HCl gas to form **hemi-acetals** (hemi means half) which being unstable immediately react with another molecule of alcohol to form stable acetals. For example,





**(5) Reduction by metal hydrides such as lithium aluminium hydride**



Similar products are also formed by  $\text{NaBH}_4$ ,  $\text{H}_2 - \text{Pt}$ ,  $\text{H}_2 - \text{Ni}$  or metal-acid.

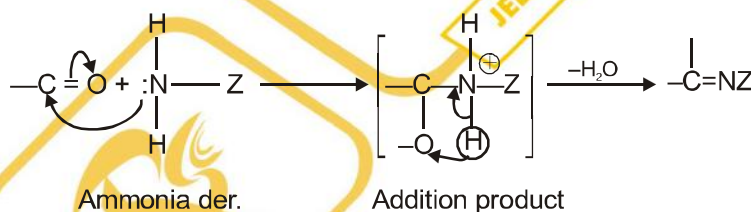
However, aldehydes and ketones can be reduced to the corresponding alkanes by means of red phosphorus and hydroiodic acid, or amalgamated zinc and concentrated hydrochloric acid (**Clemmensen reduction**) or reacting hydrazine solution followed by treatment with alkaline solution of ethylene glycol (**Wolf-kishner reduction**). The basic reaction in all these reductions is the reduction of carbonyl group to methylene group.

**(b) Nucleophilic Substitution**

**(1) Replacement of Carbonyl Oxygen :**

**(i) Reaction with Ammonia Derivatives :** Aldehydes and ketones react with a number of ammonia derivatives like  $\text{NH}_2\text{OH}$ ,  $\text{NH}_2\text{NH}_2$ ,  $\text{C}_6\text{H}_5\text{NHNH}_2$  etc. in weakly acidic medium.

Such reactions take place in slightly acidic medium and involve nucleophilic addition of the ammonia derivative followed by dehydration.



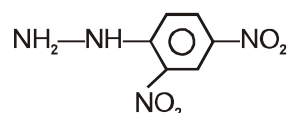
**Ammonia derivatives**

$\text{H}_2\text{N} - \text{OH}$  Hydroxylamine

$\text{H}_2\text{N} - \text{NH}_2$  Hydrazine

$\text{H}_2\text{N} - \text{NHC}_6\text{H}_5$  Phenylhydrazine

$\text{H}_2\text{N} - \text{NHCONH}_2$



2, 4 - DNP  
(also known as  
Brady's reagent)

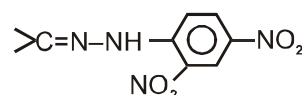
**Final products**

$>\text{C} = \text{NOH}$  Oximes

$>\text{C} = \text{NNH}_2$  Hydrazones

$>\text{C} = \text{NNHC}_6\text{H}_5$  Phenylhydrazones

Semicarbazide  $>\text{C} = \text{NNHCONH}_2$  Semicarbazones



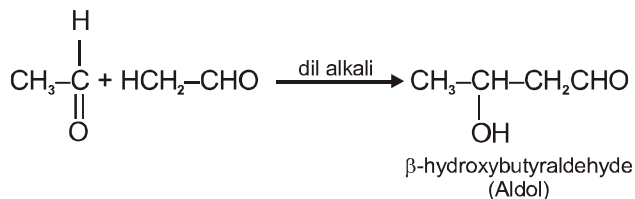
2, 4 - Dinitrophenylhydrazones  
(These are yellow or orange or red solids)



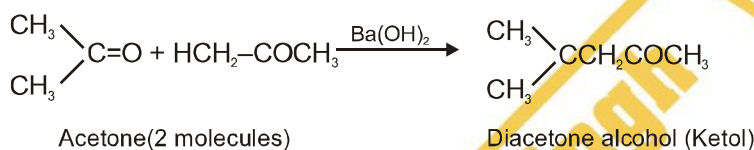
(ii) **Reaction with thioalcohols (mercaptans)** : Aldehydes and ketones react with thioalcohols and form thioacetals (mercaptals) and thioketals (mercaptals) respectively.

(2) **Reaction involving alkyl as well as carbonyl group (condensation reactions)** :

(a) **Aldol condensation between acetaldehyde molecules** :

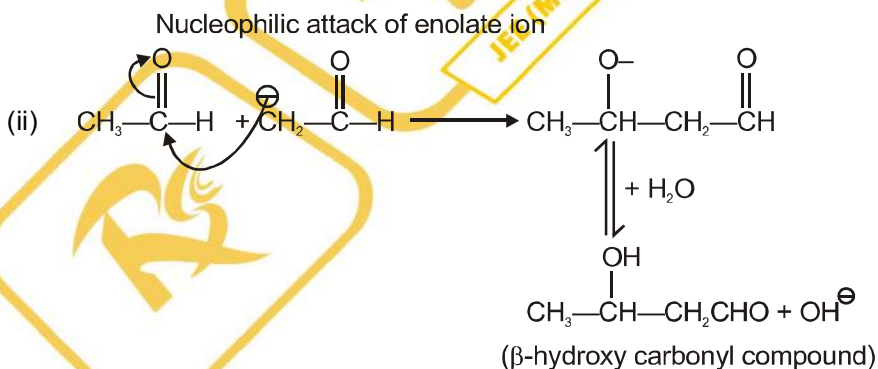


(b) **Aldol condensation between acetone molecules** :



**Mechanism :**

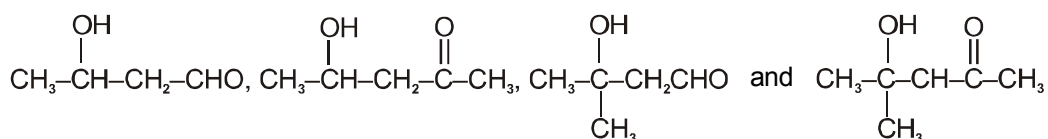
(i) **Abstraction of acidic hydrogen by base**



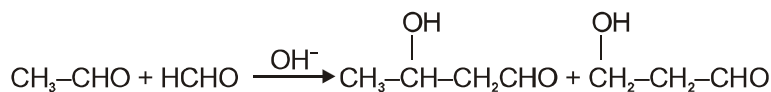
(iii) **Crossed Aldol Condensation** :

When mixture of two carbonyl compounds having α-hydrogen on at least one of them is treated with dilute alkali the mixture of products is formed and this reaction is called as crossed aldol condensation.

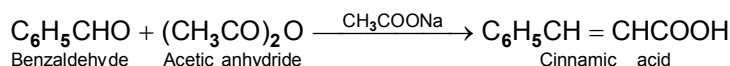
For example when mixture of CH<sub>3</sub>CHO and CH<sub>3</sub>-CO-CH<sub>3</sub> is treated with dilute alkali then four products are formed.



However if one of them does not have  $\alpha$ -hydrogen then the number of products formed will be two



(iv) **Perkin reaction** : Condensation of an aromatic aldehyde with acid anhydride in presence of base (sodium salt of the acid from which the anhydride is derived) to form  $\alpha$ ,  $\beta$ -unsaturated acid as known as **Perkin reaction**. For example,

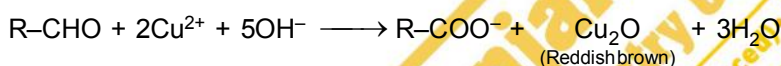


Aldehydes are oxidised not only by strong oxidising agents like  $\text{KMnO}_4$  and  $\text{K}_2\text{Cr}_2\text{O}_7$  but also by much milder oxidising agents like bromine water, Tollen's reagent, Fehling's solution and Benedict's solution.

**Tollen's reagent** : Tollen's reagent is Ammoniacal silver nitrate solution



**Fehling solution** : [Alkaline solution of copper sulphate containing sodium potassium tartarate (Roschelle salt)]

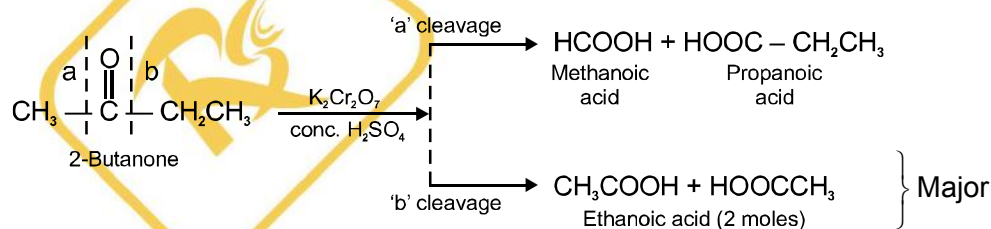


**Benedict Solution** : Its a solution of  $\text{CuSO}_4$ , sodium citrate and sodium carbonate. When heated with aldehyde it gives a reddish brown ppt. of  $\text{Cu}_2\text{O}$ .

**Note** : Benzaldehyde although reduces Tollen's reagent, it does not reduce Fehling and Benedict solutions

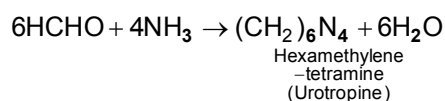
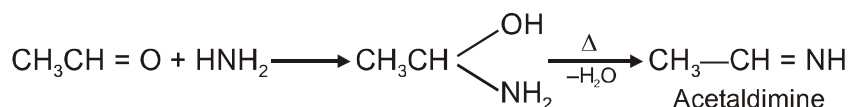
**Ketones** are not oxidised by mild oxidising agents.

**Oxidation in drastic condition**

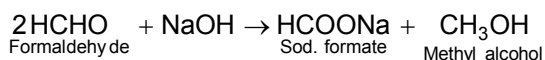


Oxidation of mixed ketones is governed by **Popoff's rule** according to which the carbonyl group of the ketone goes with the smaller alkyl group. Thus in the above case 'b' type of cleavage will decide major products.

(c) **Reaction with Ammonia** :



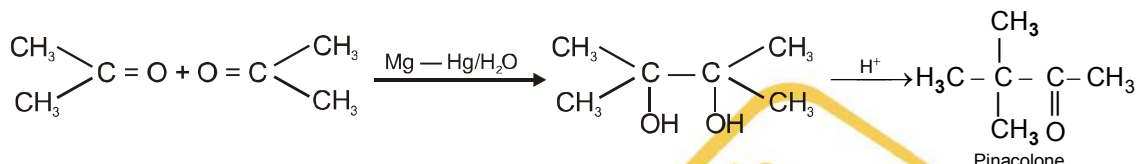
- (d) **Cannizzaro reaction** : This reaction is preferentially given by those aldehydes which do not contain  $\alpha$ -hydrogen. In Cannizzaro reaction, one molecule of the aldehyde is oxidised to acid at the expense of the other which is reduced to alcohol *i.e.*, disproportionation reaction takes place. The reaction occurs in the presence of concentrated solution of any base.



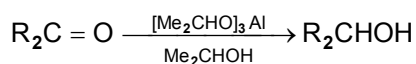
- (e) **Reaction given only by Ketones :**

(1) **Reduction in Neutral or Alkaline Medium :**

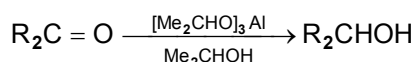
To form Pinacol which undergoes pinacol - Pinacolone rearrangement in acidic medium



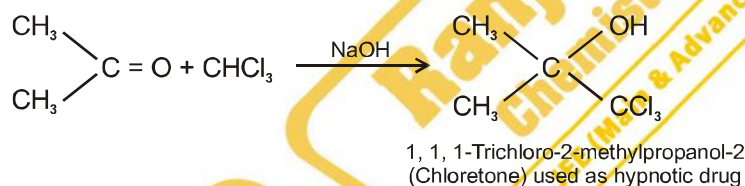
Ketones can be reduced to secondary alcohols with aluminum isopropoxide in 2-propanol solution (**Meerwein - Ponndorf Verley reduction**).



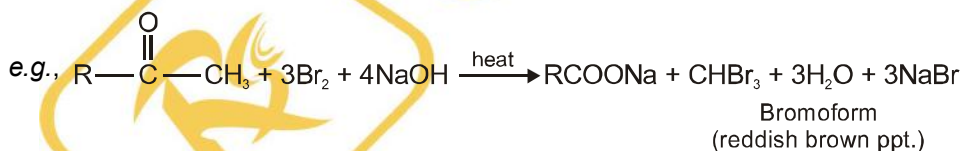
(Meerwein - Ponndorf Verley reduction).



(2) **Condensation with chloroform :**

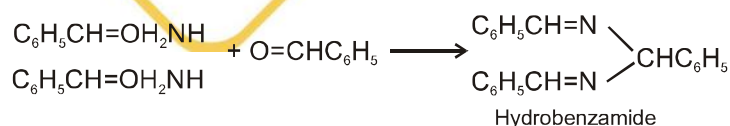


**Haloform reaction** : Methyl ketones and acetaldehyde react rapidly with halogens ( $\text{Cl}_2$ ,  $\text{Br}_2$  or  $\text{I}_2$ ) in the presence of alkali to form haloform.

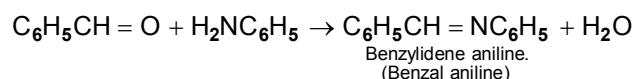


- (f) **Special Reactions of Aromatic Aldehydes and Ketones :**

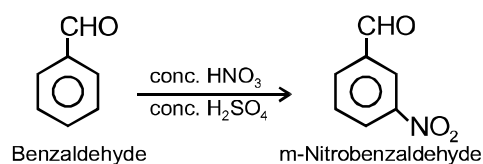
(i) **Reaction with Ammonia :**

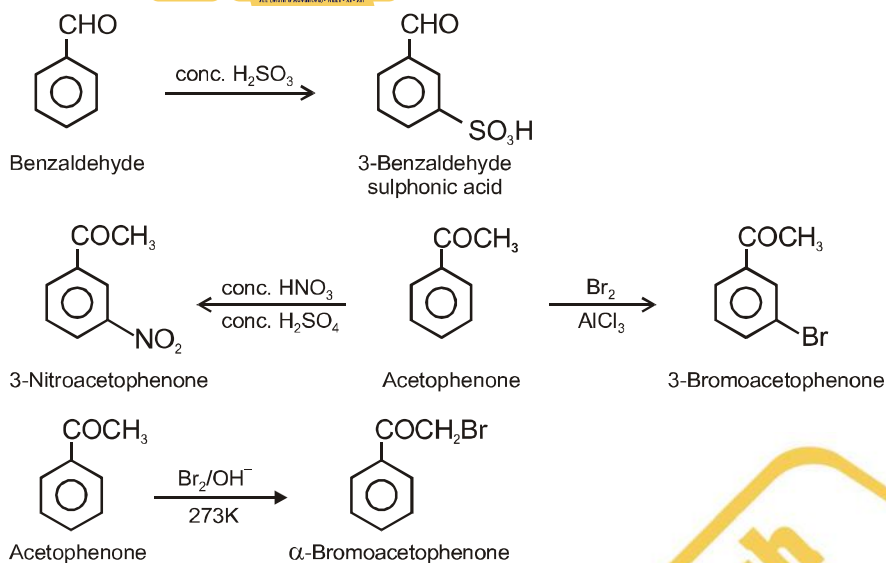


(ii) **Reaction with amines :**



(iii) **Reaction of benzene nucleus**

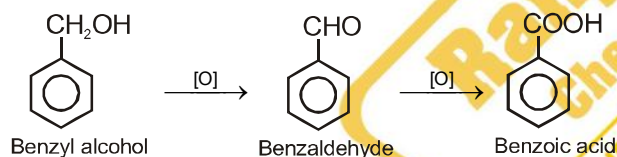




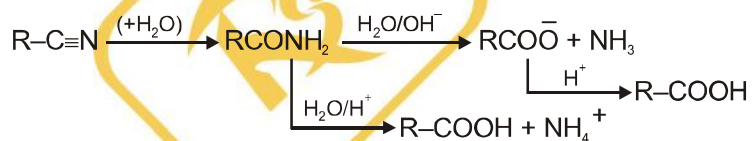
## CARBOXYLIC ACIDS

### Preparation :

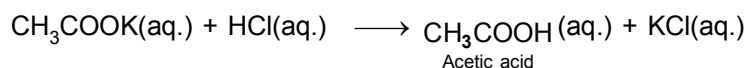
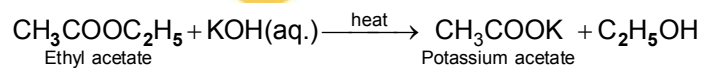
#### 1. By the oxidation of primary alcohols and aldehydes



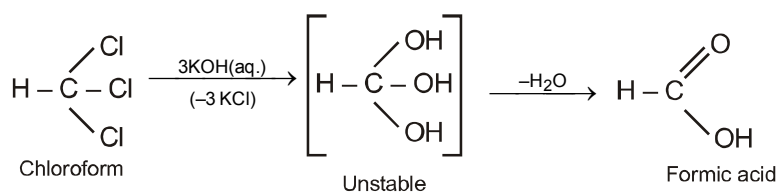
#### 2. By the hydrolysis of cyanides (nitriles)



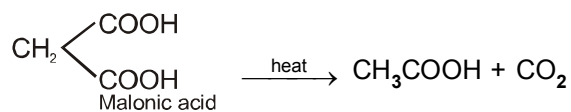
#### 3. By the hydrolysis of esters



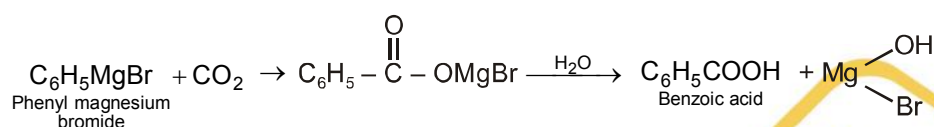
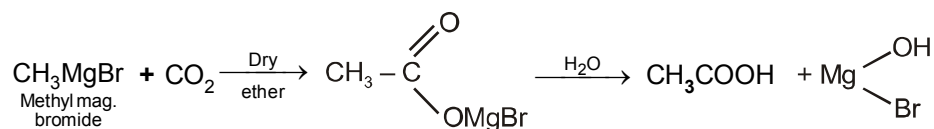
#### 4. By the hydrolysis of trihalogen derivatives of alkanes



5. By heating malonic acid and their derivative acids.

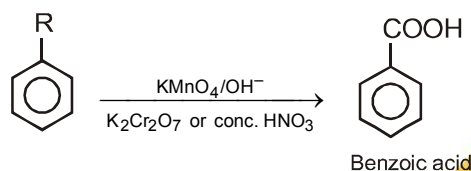


6. By the reaction of Grignard reagent with  $\text{CO}_2$



Product in above reactions have one more carbon than that in Grignard reagent taken.

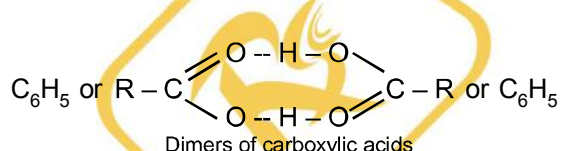
7. By oxidation of alkyl benzenes



Physical properties

- The first three members ( $\text{C}_1$  to  $\text{C}_3$ ) are colourless, pungent smelling liquids, the next three ( $\text{C}_4$  to  $\text{C}_6$ ) have unpleasant odours. Acids with 7 or more carbon atoms have no distinct smell because of low volatility.

Two molecules of carboxylic acids are held together not by one but by two strong hydrogen bonds.

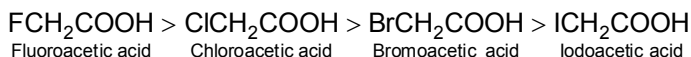


The behaviour of **formic acid is exceptional**. It exists as a dimer in vapour state and a polymer in liquid and solid states. Their H-bonding is so strong that even in vapour state they exist as dimer *i.e.*, H-bond is not broken even in vapour state.

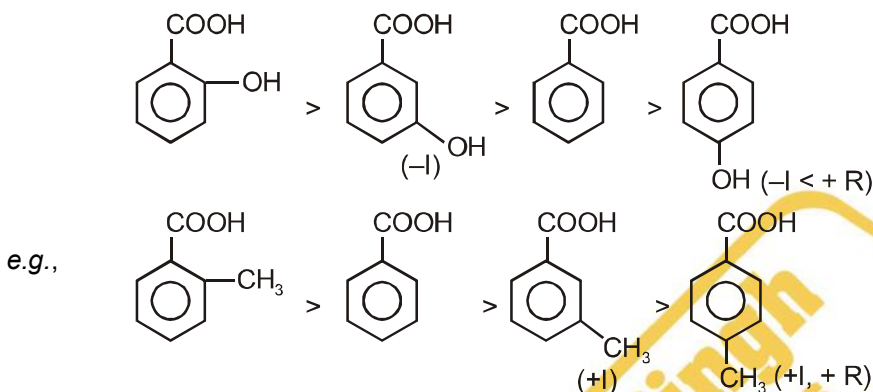
- In normal carboxylic acids, the even members have markedly higher melting points than the odd members preceding or following it (**oscillation** or **alternation effect**).

**Effect of Substituents on Acidity** : We know that the carboxylic acids are acidic in nature because of the stabilisation (*i.e.*, dispersal of negative charge) of carboxylate ion. So any factor which can enhance the dispersal of negative charge of the carboxylate ion will increase the acidity and *vice versa*. Thus electron-withdrawing substituents (like halogen,  $-\text{NO}_2$ ,  $-\text{C}_6\text{H}_5$ , etc.) would disperse the negative charge and hence stabilise the carboxylate ion and thus increase acidity of the parent acid. On the other hand, electron-releasing substituents would increase the negative charge, destabilise the carboxylate ion and thus decrease acidity of the parent acid and vice-versa.

e.g., the acidic strength of the corresponding halogen acids also follows the same order i.e.



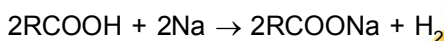
**Orthoeffect** : Among derivative of aromatic carboxylic acid, ortho derivative is the most acidic. This effect is called as ortho effect.



## Chemical Properties

### A. Reaction involving hydrogen atom of the –COOH group

Reaction with metals, alkalis, carbonates and bicarbonates.



### B. Reaction involving –OH group of carboxylic acids (*Formation of acid derivatives*).

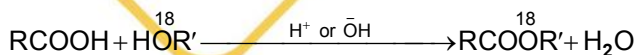
#### (i) Reaction with phosphorus halides or thionyl chloride (*Formation of acid halides*).



#### (ii) Reaction with ammonia

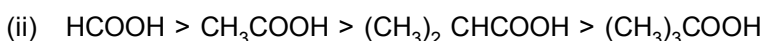
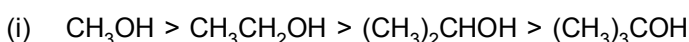


#### (iii) Reaction with alcohols (*esterification*). Carboxylic acids react with alcohols in the presence of an acid or alkali to form esters. This reaction is known as esterification

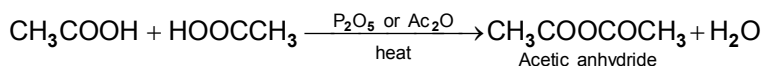


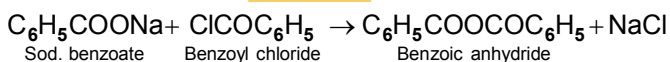
Presence of dehydrating agent makes the reaction in forward direction.

The greater the bulk of the substituent(s) near the –OH group of alcohol and / or –COOH group of acid, the slower the esterification. Thus the rate of esterification decreases in the following order



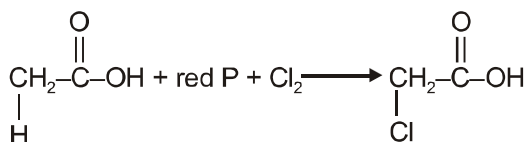
#### (iv) Dehydration (Formation of anhydrides). Carboxylic acids, when heated in presence of a dehydrating agent like $\text{P}_2\text{O}_5$ or acetic anhydride, undergo dehydration to form acid anhydrides.





### C. Reactions involving – CO – part of the –COOH group

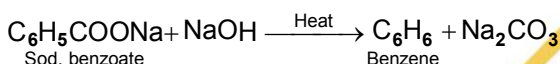
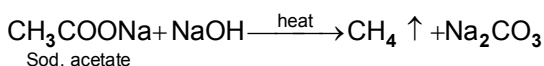
**Hell-Volhard Zelinsky reaction** : Carboxylic acids having  $\alpha$ -hydrogen when treated with red P +  $\text{Cl}_2$  or  $\text{Br}_2$  or  $\text{I}_2$  followed by hydrolysis form  $\alpha$ -chlorinated (or brominated or iodinated) derivative of carboxylic acid.



This reaction is used to form  $\alpha$ -substituted products of carboxylic acid.

### D. Reactions of Salts of Carboxylic Acids :

- (i) Heating of sodium salts with soda lime ( $\text{NaOH} + \text{CaO}$ ) to form alkanes.



- (ii) Electrolysis of conc. aqueous solution of sodium or potassium salts gives alkanes.



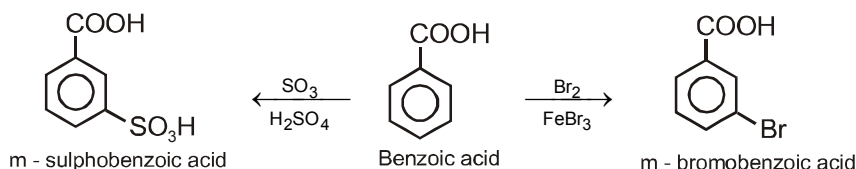
- (iii) Heating of ammonium salts



- (iv) Dry distillation of calcium salts (**Formation of aldehydes and ketones**).



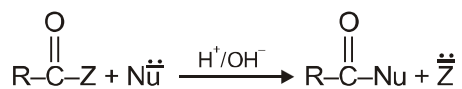
**E. Ring substitution in aromatic acids.** Since the  $-\text{COOH}$  group is deactivating and m-directing, it directs the new group at m-position. Further, since the  $-\text{COOH}$  group is deactivating, electrophilic substitution (halogenation, nitration, and sulphonation) takes place only under drastic conditions. Deactivation by  $-\text{COOH}$  group is so strong that aromatic acids do not undergo Friedel-Craft reaction.



**Derivatives of carboxylic acids** : These are formed by the replacement of  $-\text{OH}$  group of acid by some other suitable group e.g.  $\text{RCOCl}$ ,  $\text{RCONH}_2$ ,  $\text{RCOOR}'$  and  $(\text{RCO})_2\text{O}$ .

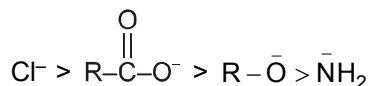
### Order of Reactivity Towards Nucleophilic Substitution Reaction :

Carboxylic acid derivatives undergo nucleophilic substitution in either acidic or basic medium.

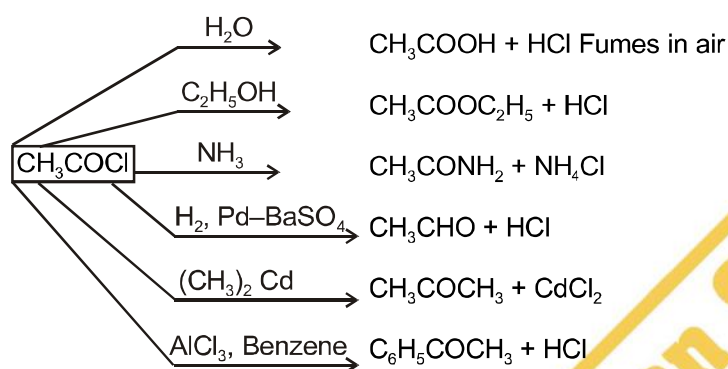


Ease of reactivity of different derivative of carboxylic acid depend upon leaving group ability of  $\overset{\ominus}{Z}$ .

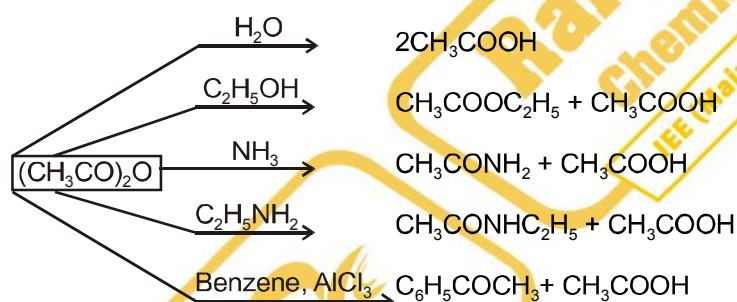
Weaker the base better is the leaving group as anion. Thus leaving group ability is as



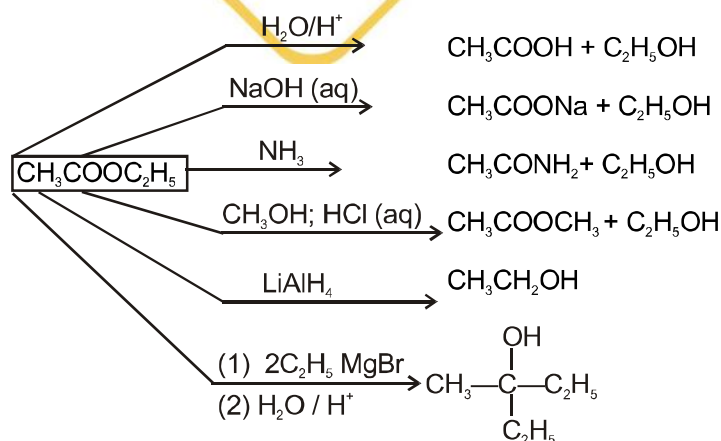
**Properties :**



**Acid Anhydrides:**  $(RCO)_2O$ , prepared by dehydration of carboxylic acid.



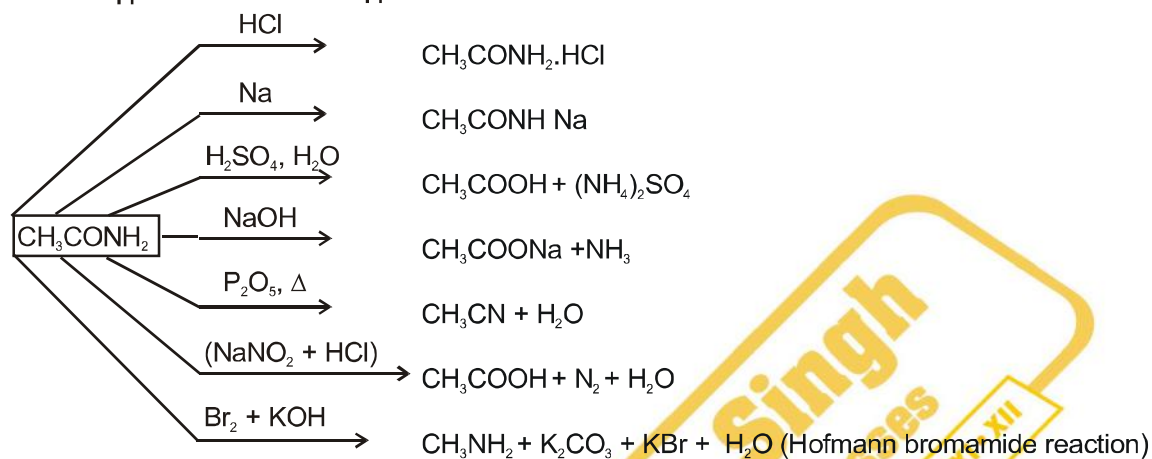
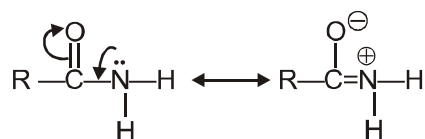
**Esters:**  $RCOOR$  prepared by reaction of acid with alcohol or acid chloride or anhydrides with alcohol.





**Acid amides:**  $RCONH_2$  – It is prepared by reaction of carboxylic acid or its derivatives with  $NH_3$ . It is amphoteric in nature.

Acid amides act as weak acids as well as weak bases due to the structures given:



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## TOPIC WISE MCQS

### Aldehyde & Ketone

#### Methods of Preparation of carbonyl compounds

- The best method for the conversion of ethanol to ethanal is-
  - By passing ethanol vapours over Cu at 578 K
  - By oxidation with acidic potassium dichromate
  - By oxidation with manganese dioxide at 300°C
  - By oxidation with acidic  $\text{KMnO}_4$
- When propyne reacts with 20%  $\text{H}_2\text{SO}_4$  & 1%  $\text{HgSO}_4$ , we get-
  - Acetaldehyde
  - Propanaldehyde
  - Acetone
  - Formic acid
- The product formed by the reaction of propyne with dil.  $\text{H}_2\text{SO}_4$  in the presence of  $\text{Hg}^{2+}$  can not be prepared by the following reaction-
  - Dry distillation of calcium ethanoate
  - By passing vapours of ethanoic acid over  $\text{MnO}$  at 300°C
  - By ozonolysis of 2- Butene
  - By alkaline hydrolysis of isopropylidene chloride
- Except acetylene, other alkynes react with  $\text{H}_2\text{O}$  to give-
  - Aldehyde
  - $\text{CH}_3\text{CHO}$
  - Ketones
  - Alkanal.
- When  $\text{CH}_3\text{MgI}$  reacts with  $\text{CH}_3\text{CN}$  and the product is hydrolysed, we get-
  - Propanal
  - Acetone
  - Formaldehyde
  - Acetaldehyde
- Ethylidene chloride ( $\text{CH}_3\text{CHCl}_2$ ) on hydrolysis with  $\text{NaOH}$  gives -
  - $\text{CH}_3\text{CHO}$
  - $\text{CH}_3\text{COCH}_3$
  - $\text{CH}_3\text{CH}(\text{OH})_2$
  - $\text{C}_2\text{H}_5\text{OH}$
- $(\text{HCOO})_2\text{Ca} + (\text{CH}_3\text{COO})_2\text{Ca} \xrightarrow{\text{on dry}}$  "A" - Product A is-
  - Propanone
  - Methanal
  - Ethanal
  - One of the above
- When calcium acetate is heated with calcium formate then, we get-
  - Methanol
  - Acetic acid
  - Acetaldehyde
  - Acetone
- Partial oxidation of methane gives-
  - $\text{HCHO}$
  - $\text{HCOOH}$
  - $\text{H}_2\text{O}$  and  $\text{CO}_2$
  - $\text{CO}$  and  $\text{H}_2$
- The reaction -
 
$$\text{CH}_3\text{COCl} + \text{H}_2 \xrightarrow[\text{Pd/BaSO}_4]{\text{Xylene}} \text{CH}_3\text{CHO} + \text{HCl}$$
 is
  - Stephen's reaction
  - Rosenmund reaction
  - Hoffmann reaction
  - Cannizzaro's reaction
- Acetone will be obtained by the ozonolysis of -
  - 1-Butene
  - 2-Butene
  - Isobutene
  - 2-Butyne
- What is the function of  $\text{BaSO}_4$  in Rosenmund reactionn -
  - To stop further oxidation of aldehyde
  - To stop further reduction of aldehyde
  - Act as a poisonous catalyst
  - It checks the reactivity of pd.
- The slow partial oxidation of ethyl alcohol is likely to form-
  - $\text{CO}_2 + \text{H}_2\text{O}$
  - Acetic acid
  - $\text{CH} + \text{H}_2\text{O}$
  - Acetaldehyde
- Reaction of ethyl formate with excess of  $\text{CH}_3\text{MgI}$  followed by hydrolysis gives:
  - n-Propyl alcohol
  - Ethanal
  - Propanal
  - Isopropyl alcohol

#### Physical Properties

- Compound used for preserving dead bodies is -
  - $\text{CH}_2\text{O}$  (40%)
  - $\text{CH}_3\text{CHO}$  (10%)
  - $\text{CH}_3\text{OH}$  (25%)
  - $\text{C}_2\text{H}_5\text{OH}$  (40%)

16. Which of the following forces is correctly described about boiling point of Aldehydes & ketones -  
 (A) Hydrogen bond  
 (B) Vander wall force  
 (C) Dipole-dipole attraction  
 (D) None of these
17. Which aldehyde is insoluble in  $H_2O$  -  
 (A) Propanal (B) Ethanal  
 (C) Butanal (D) Heptanal
22. The vapour density of a compound is 29, which reacts with iodine and NaOH to form a yellow compound. The compound is-  
 (A)  $CH_3COOH$  (B)  $CH_3COCH_3$   
 (C)  $CH_3CHOHCH_3$  (D)  $CH_3OH$
23. Stephen reaction is the reaction involving:  
 (A) Reduction of alkanoyl chloride with Pd/ $BaSO_4$ .  
 (B) Reduction of alkyl isocyanide with sodium and alcohol.  
 (C) Reduction of alkyl cyanide with  $SnCl_2$  and HCl and hydrolysing the intermediate aldimine.  
 (D) Reduction of carbonyl compound with zinc amalgam and HCl.

### Chemical Properties

18. The general order of reactivity of carbonyl compounds for nucleophilic addition reactions is -  
 (A)  $H_2C = O > RCHO > ArCHO > R_2C = O > Ar_2C = O$   
 (B)  $ArCHO > Ar_2C = O > RCHO > R_2C = O > H_2C = O$   
 (C)  $Ar_2C = O > R_2C = O > ArCHO > RCHO > H_2C = O$   
 (D)  $H_2C = O > R_2C = O > Ar_2C = O > RCHO > ArCHO$
19. Least reactive towards nucleophilic addition is -  
 (A)  $CH_2 = O$  (B)  $CCl_3 - \overset{\overset{O}{||}}{C} - C_2H_5$   
 (C)  $CH_3 - \overset{\overset{O}{||}}{C} - C_2H_5$  (D)  $CH_3 - \overset{\overset{O}{||}}{C} - H$
20. What would be the product when acetaldehyde reacts with HCN and the product is further hydrolysed-  
 (A) 2-Hydroxy propanoic acid  
 (B) Lactic acid  
 (C) Both A & B  
 (D) None of these
21. Reaction of ammonia derivative with carbonyl compound is an example of -  
 (A) Addition and Substitution  
 (B) Substitution and Elimination  
 (C) Addition and Elimination  
 (D) Addition and intramolecular substitution
24. Acetone gives test with-  
 (A) 2,4 Dinitro phenyl hydrazine  
 (B) Fehling solution  
 (C) Schiff's reagent (D) All
25. A ketone reacted with ethyl magnesium bromide followed by hydrolysis gave a product which on dehydration gave an alkene. The alkene on ozonolysis gave diethyl ketone and acetaldehyde. The ketone is-  
 (A) Dimethyl ketone (B) Ethyl methyl ketone  
 (C) Diethyl ketone (D) Ethyl propyl ketone
26. Aldol condensation between the following compounds followed by dehydration gives methyl vinyl ketone-  
 (A) HCHO and  $CH_3COCH_3$   
 (B) HCHO and  $CH_3CHO$   
 (C) Two molecules of  $CH_3CHO$   
 (D) Two molecules of  $CH_3COCH_3$
27. In Cannizzaro reaction-  
 (A) Aldehyde is converted into alcohol  
 (B) Alcohol is converted into aldehyde  
 (C) Primary amine is converted into isocyanide  
 (D) Acid is converted into amine
28. HCHO with conc. alkali forms two compounds. The change in oxidation number would be-  
 (A) (0 to -2) in both the compounds  
 (B) (0 to +2) in both the compounds  
 (C) (0 to +2) in one compound and (0 to -2) in the second compound  
 (D) All are correct

29. For Cannizzaro's reaction. Which is necessary-  
 (A) Presence of  $\alpha$ -C (B) Absence of  $\alpha$ -C  
 (C) Presence of  $\alpha$ -H (D) Absence of  $\alpha$ -H
30. One mole of an organic compound requires 0.5 mole of oxygen to produce an acid. The compound may be-  
 (A) Alcohol (B) Ether  
 (C) Ketone (D) Aldehyde
31. Which is most difficult to oxidise-  
 (A) HCHO (B) CH<sub>3</sub>CHO  
 (C) CH<sub>3</sub>COCH<sub>3</sub> (D) CH<sub>3</sub>CH<sub>2</sub>CHO
32. For the reaction  $RCH=O + 2[H] \rightarrow RCH_2OH$  the catalyst is-  
 (A) Ni only (B) Pd. only  
 (C) Pt. only (D) Any of the above
33. Acetone shows similarity with acetaldehyde in reacting to-  
 (A) Schiff's reagent (B) Fehling solution  
 (C) Grignard reagent (D) Tollen's reagent
34. Aldehydes and ketones can be reduced to corresponding hydrocarbons by-  
 (A) Refluxing with strong acids  
 (B) Passing the vapours over PbO<sub>2</sub>  
 (C) Refluxing with zinc amalgam  
 (D) Refluxing with strong base
35. Formaldehyde polymerises from 6 to 100 molecules to form-  
 (A) Formalin (B) Metaldehyde  
 (C) Paraformaldehyde (D) None
36. Metaformaldehyde is a -  
 (A) Trimer of HCHO  
 (B) Dimer of HCHO  
 (C) Hexamer of CH<sub>3</sub>CHO  
 (D) Hexamer of HCHO
37. Which of the following combinations give t-butyl alcohol when treated with Grignard reagent-  
 (A) CH<sub>3</sub>MgBr + CH<sub>3</sub>COCH<sub>3</sub>  
 (B) C<sub>2</sub>H<sub>5</sub> MgBr + CH<sub>3</sub>COCH<sub>3</sub>  
 (C) CH<sub>3</sub>MgBr + (CH<sub>3</sub>)<sub>3</sub>C. OH  
 (D) CH<sub>3</sub>MgBr + CH<sub>3</sub>CH<sub>2</sub>CHO
38. On polymerisation of Ethanal, sleeping drug is formed & i.e.-  
 (A) Phorone (B) Mesitylene  
 (C) Paraldehyde (D) Metaldehyde
39. The name of the compound  

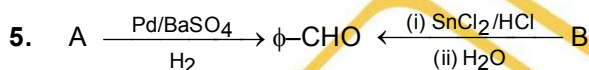
$$(CH_3)_2 - \overset{NH_2}{\underset{|}{C}} - CH_2 - COCH_3$$
 is-  
 (A) Diacetone (B) Acetonamine  
 (C) Diacetanamine (D) Aminoacetone
40. The conversion CH<sub>3</sub>CH<sub>2</sub>CHO  $\xrightarrow{\quad}$  CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>OH can not be affected by:  
 (A) NaBH<sub>4</sub> (B) Zn/HCl  
 (C) H<sub>2</sub>/Ni (D) Na + alcohol
41. Which of the following can be used to differentiate between ethanal and propanal-  
 (A) Ammonical AgNO<sub>3</sub>  
 (B) Ammonical AgNO<sub>3</sub> in presence of tartrate ions  
 (C) I<sub>2</sub> in presence of base  
 (D) Ammonical AgNO<sub>3</sub> in presence of citrate ions
42. Fehling's solution -B is-  
 (A) NH<sub>4</sub>OH (B) Cu(OH)<sub>2</sub>  
 (C) CuO (D) Cu<sub>2</sub>O
43. The reaction,  

$$2RCHO \xrightarrow{Al-ethoxide} RCOOCH_2 R$$
 is called-  
 Ester  
 (A) Tishenko reaction  
 (B) Knoevangel reaction  
 (C) Cannizzaro reaction  
 (D) HVZ reaction
44. Which of the following does not turn schiff's reagent to pink-  
 (A) Formaldehyde (B) Benzaldehyde  
 (C) Acetone (D) Acetaldehyde

## Benzaldehyde

### General Method of Preparation

- By treating toluene with chromyl chloride in  $\text{CCl}_4$  and decomposing the complex with water, the reaction is named as –  
(A) Etard reaction  
(B) Sandmeyer's reaction  
(C) Schotten Baumann reaction  
(D) Stephen's reaction
- In the preparation of benzaldehyde by Stephen's reaction the main reactant cannot be named as –  
(A) Phenyl cyanide (B) Benzonitrile  
(C) Benzene carbonitrile (D) Benzal cyanide
- Oxidation of toluene to benzaldehyde has to be easily done with –  
(A) Acidic  $\text{K}_2\text{Cr}_2\text{O}_7$  (B)  $\text{CrO}_2\text{Cl}_2$   
(C) Acidic  $\text{KMnO}_4$  (D) Alkaline  $\text{KMnO}_4$
- Benzaldehyde will be formed in the reaction –  
(A) Hydrolysis of  $\text{C}_6\text{H}_5\text{CHCl}_2$   
(B) Ozonolysis of  $\text{C}_6\text{H}_5\text{CH} = \text{CH}_2$   
(C) Both the above  
(D) None of the above



A and B respectively are –

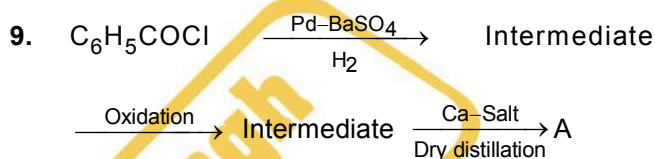
- (A) Benzoyl chloride, benzonitrile  
(B) Benzyl chloride, benzylnitrile  
(C) Benzal chloride, benzonitrile  
(D) Benzotrichloride, benzonitrile

### Structure

- Benzo radical in the following is –  
(A)  $\text{C}_6\text{H}_5\text{CH}_2\text{-}$  (B)  $\text{C}_6\text{H}_4\text{<}$   
(C)  $\text{C}_6\text{H}_5\text{-}$  (D)  $\text{C}_6\text{H}_5 - \text{C}$
- $-\text{CHO}$  group in benzene nucleus –  
(A) Activates the ring  
(B) Deactivates the ring  
(C) Does not affect the ring  
(D) None of these

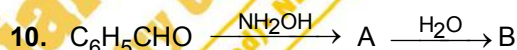
### Chemical Reaction

- In connection with benzaldehyde which of the following statement is incorrect –  
(A)  $-\text{CHO}$  group of benzaldehyde is meta directing  
(B) Benzaldehyde undergoes Claisen condensation  
(C) Benzaldehyde on oxidation gives phenyl acetic acid  
(D) Benzaldehyde on reduction gives benzyl alcohol



Compound (A) in above reaction sequence is –

- (A) Benzophenone (B) Benzaldehyde  
(C) Acetophenone (D) Benzoquinone



What is not true for the compound B –

- (A) Gives cannizaro's reaction  
(B) Acts as strong reducing agent  
(C) Gives phenol on reduction  
(D) Gives optical active compound with HCN

- An organic aromatic compound containing C, H & O has a characteristic smell of bitter almonds. This on oxidation with potassium permanganate gives a monobasic acid. The sodium salt of which on distillation with sodalime gives benzene. What is the original compound –

- (A)  $\text{C}_6\text{H}_5\text{CH}_2\text{CHO}$  (B)  $\text{C}_6\text{H}_5\text{CHO}$   
(C)  $\text{C}_6\text{H}_5\text{OH}$  (D) None of the above

- Benzaldehyde is oxidised and reduced simultaneously in the presence of –

- (A)  $\text{NaHCO}_3$  (B)  $\text{NaOH}$   
(C)  $\text{Na}_2\text{CO}_3$  (D)  $\text{HCl}$



I, II are –

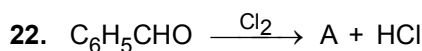
- (A) Benzoic acid, Benzaldehyde ammonia  
(B) Benzoic acid, Hydrobenzamide  
(C) Phenyl acetic acid, Benzaldehyde ammonia  
(D) Benzoic acid, Aniline

14.  $C_6H_5CHO + PCl_5$ , the product is –  
 (A) Benzyl chloride      (B) Benzotrichloride  
 (C) Benzal chloride      (D) Triphenyl phosphate
15. Benzaldehyde is heated with a conc. solution of KOH to form –  
 (A)  $C_6H_5CH_2OH$   
 (B)  $C_6H_5COOH$   
 (C)  $C_6H_5COOK$   
 (D)  $C_6H_5COOK + C_6H_5CH_2OH$
16. Benzaldehyde and formaldehyde give a common reaction –  
 (A) Cannizzaro's reaction  
 (B) Benzoin condensation  
 (C) Claisen condensation  
 (D) Perkin's reaction
17. Benzaldehyde can be converted to benzyl alcohol by –  
 (A) HCl  
 (B) NaOH  
 (C)  $LiAlH_4$   
 (D) B and C are correct
18. Benzyl alcohol from benzaldehyde is obtained in the following reaction –  
 (A) Cannizzaro's reaction (B) Kolbe's reaction  
 (C) Wurtz reaction      (D) Fitting's reaction
19. Benzaldehyde condenses with acetic anhydride to give cinnamic acid in presence of –  
 (A) Sodium acetate      (B) Sodium chloride  
 (C) Sodium benzoate      (D) Sodium metal



The reactant is obtained by dry distillation of the calcium salts of the following pairs –

- (A)  $C_6H_5CH_2COOH, HCOOH$   
 (B)  $C_6H_5COOH, HCOOH$   
 (C)  $C_6H_4(OH)COOH, HCOOH$   
 (D)  $C_6H_4(NH_2)COOH, HCOOH$
21. Hydrobenzamide is formed in the reaction –  
 (A)  $C_6H_5COOH + NH_3$   
 (B)  $C_6H_5CHO + NH_3$   
 (C)  $HCHO + NH_3$   
 (D)  $CH_3COCH_3 + NH_3$



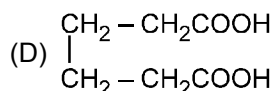
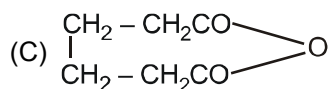
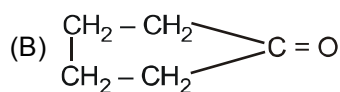
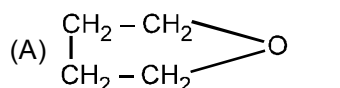
The product A when reacts with the following compounds the reaction is known as Schotten – Baumann reaction –

- (A)  $C_6H_5NH_2$       (B)  $C_6H_5CH_2OH$   
 (C)  $C_6H_5OH$       (D) All of these
23. Benzaldehyde shows different reaction than aliphatic aldehyde with the following reagent –  
 (A) Tollen's reagent      (B) Schiff's reagent  
 (C) Fehling's reagent      (D) Hydroxylamine
24. HCHO and  $C_6H_5CHO$  can be distinguished by –  
 (A) Fehling solution      (B) Tollen's reagent  
 (C)  $KMnO_4$       (D) All of these
25. Which statement is true about benzaldehyde –  
 (A) It does not react with Tollen's reagent  
 (B) It does not react with Fehling's solution  
 (C) It does not react with HCN  
 (D) It does not react with  $NaHSO_3$

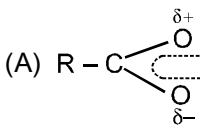
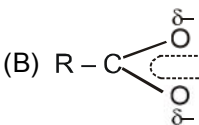
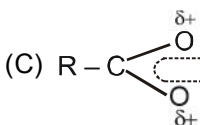
## Carboxylic Acid

### Preparation and Target course

1. Which of the following products is formed when adipic acid is heated –



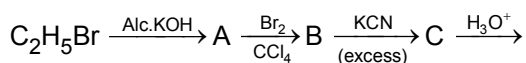
2. Malonic acid and succinic acid are distinguished by –  
 (A) Heating      (B)  $NaHCO_3$   
 (C) Both A & B      (D) None of these

3. Hydrolysis of 1,1, 1-trichloro derivative (A) of alkane gives a molecule (B) on alkaline hydrolysis which produces red coloration with aqueous  $\text{FeCl}_3$ . The compound (A) is -  
 (A)  $\text{CH}_3\text{CH}_2\text{CCl}_3$  (B)  $\text{CH}_3\text{CCl}_3$   
 (C)  $\text{CHCl}_3$  (D) None
4. Which of the following is the best representation of the structure of the carboxylate ion -  
 (A)  (B)   
 (C)  (D) None of these
5. Which of the following compounds does not have a carboxyl group -  
 (A) Methanoic acid (B) Ethanoic acid  
 (C) Picric acid (D) Benzoic acid
6. Hydrolysis of an ester gives acid A and alcohol B. The acid reduces Fehling's solution. Oxidation of alcohol B gives acid A. The ester is -  
 (A) Methyl formate (B) Ethyl formate  
 (C) Methyl acetate (D) Ethyl acetate
7. Which one of the following on oxidation will not give a carboxylic acid with the same number of carbon atoms -  
 (A)  $\text{CH}_3\text{COCH}_3$  (B)  $\text{CCl}_3\cdot\text{CH}_2\text{CHO}$   
 (C)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$  (D)  $\text{CH}_3\text{CH}_2\text{CHO}$
8. Identify Z in the sequence  

$$\text{CH}_3\text{COONH}_4 \xrightarrow[\text{(ii) P}_2\text{O}_5]{\text{(i) heat}} \text{Y} \xrightarrow{\text{H}_2\text{O}(\text{H}^+)} \text{Z} -$$
 (A)  $\text{CH}_3\text{CH}_2\text{CONH}_2$  (B)  $\text{CH}_3\text{CN}$   
 (C)  $\text{CH}_3\text{COOH}$  (D)  $(\text{CH}_3\text{CO})_2\text{O}$
9. When oxalic acid is heated, which one of the following is formed along with  $\text{CO}_2$  -  
 (A) Acetic acid (B) Glyceric acid  
 (C) Formic acid (D) None of these
10. Which one of the following reacts with Grignard reagent to form an addition product which can be hydrolysed to a carboxylic acid?  
 (A)  $\text{O}_2$  (B)  $\text{CO}_2$   
 (C)  $\text{SO}_2$  (D) None
11. A halogen compound 'A' on hydrolysis with dilute alkali followed by acidification gives acetic acid. The compound X is -  
 (A)  $\text{ClCH}_2\text{CH}_2\text{Cl}$  (B)  $\text{CH}_3\text{CHCl}_2$   
 (C)  $\text{ClCH}_2\text{CHCl}_2$  (D)  $\text{CH}_3\text{CCl}_3$
12. Acetic acid is obtained when -  
 (A) Methyl alcohol is oxidised with potassium permanganate  
 (B) Formaldehyde is oxidised with potassium dichloromate and sulphuric acid  
 (C) Acetonitrile is hydrolysed with a dilute mineral acid  
 (D) Glycerol is heated with sulphuric acid
13. In Quick Vinegar Process, the aerial oxidation of ethyl alcohol to acetic acid is brought about by -  
 (A) Acetic (B) Maltase  
 (C) Invertase (D) Mycoderma aceti
14. Sodium salt of formic acid on strong heating followed by acidification gives-  
 (A) Formic acid (B) Oxalic acid  
 (C) Formaldehyde (D) Acetaldehyde
15. When malonic acid is heated, it gives -  
 (A) Formic acid (B) Oxalic acid  
 (C) Acetic anhydride (D) Acetic acid

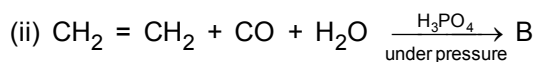
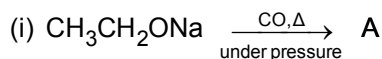
### Physical Properties

16. The acid D obtained through the following sequence of reactions is -



- (A) Succinic acid (B) Malonic acid  
 (C) Maleic acid (D) Oxalic acid

17. In the following reactions -



A and B respectively are :

- (A)  $\text{CH}_3\text{CH}_2\text{COOH}$  in both cases  
 (B)  $\text{CH}_3\text{CH}_2\text{CHO}$  in both cases  
 (C)  $\text{CH}_3\text{CH}_2\text{COOH}$ ,  $\text{CH}_3\text{CHO}$   
 (D)  $\text{CH}_3\text{CHO}$ ,  $\text{CH}_3\text{COOH}$

18. Acetic acid exists as dimer in  $C_6H_6$  due to-

- (A) Condensation reaction  
(B) Hydrogen bonding  
(C) Presence of a carboxyl group  
(D) Presence of hydrogen at  $\alpha$ -carbon

19. Carboxylic acid group can be detected by -

- (A) Sodium bisulphite test  
(B) Fehling's solution test  
(C) Tollen's reagent  
(D) With  $NaHCO_3$

20. The  $pK_a$  values of the four carboxylic acids are given below. Which of the following is the weakest acid ?

- (A) 4.38 (B) 2.87  
(C) 1.26 (D) 0.64

21. Phenol is a weaker acid than acetic acid because-

- (A) Phenoxide ion is better stabilized by resonance than acetate ion  
(B) Acetate ion is better stabilized by resonance than phenoxide ion  
(C) Phenol is less soluble in water than acetic acid  
(D) Both phenoxide ion and acetate ion are equally stable

22. Which of the following is the weakest acid ?

- (A)  $Cl_3CCOOH$  (B)  $Cl_2CHCOOH$   
(C)  $ClCH_2COOH$  (D)  $CH_3COOH$

23. Formic acid is a stronger acid than acetic acid. This is due to the fact that ?

- (A) Formic acid is a reducing agent  
(B) Formic acid molecule is of smaller size  
(C) There is no alkyl group on  $\alpha$ -carbon in formic acid  
(D) Formic acid does not undergo association

24. Which of the following dicarboxylic acids contains the most acidic hydrogen ?

- (A) Maleic acid (B) Fumaric acid  
(C) Succinic acid (D) Malonic acid

25. Increasing  $pK_a$  of o, m- and p-nitrobenzoic acid is ?

- (A)  $p < m < o$  (B)  $o < m < p$   
(C)  $o < p < m$  (D)  $m < p < o$

## Chemical Properties

26. Amongst the acids,

- (i)  $CH \equiv CCOOH$   
(ii)  $CH_2 = CHCOOH$  and  
(iii)  $CH_3CH_2COOH$ , the acid strength follows the sequence

- (A) (i) < (ii) > (iii) (B) (i) > (ii) > (iii)  
(C) (i) = (ii) = (iii) (D) (i) = (ii) > (iii)

27. The increasing order of acidity of  $\alpha$ ,  $\beta$  and  $\gamma$ -chlorobutyric acids is -

- (A)  $\alpha < \beta < \gamma$  (B)  $\beta < \gamma < \alpha$   
(C)  $\gamma < \alpha < \beta$  (D)  $\gamma < \beta < \alpha$

28. Which of the following is a polyprotic acid -

- (A) Acetic acid (B) Benzoic acid  
(C) Salicylic acid (D) Oxalic acid

29. Which of the following acids combines the properties of an aldehyde and an acid ?

- (A) Benzoic acid (B) Acetic acid  
(C) Formic acid (D) Oxalic acid

30. Formic acid reacts with  $PCl_5$  to form -

- (A) Acetyl chloride  
(B) Methyl chloride  
(C) Carbon monoxide and hydrogen chloride  
(D) formyl chloride

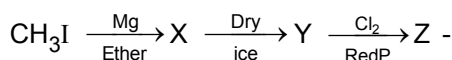
31. The Hell-Volhard Zelinsky reaction is used for preparing a/an -

- (A)  $\beta$ -Haloacid (B)  $\gamma$ -Haloacid  
(C) Acid halide (D)  $\alpha$ -Haloacid

32. When excess of chlorine is passed through acetic acid in presence of red phosphorus, it forms -

- (A) Acetyl chloride (B) Chloral  
(C) Trichloroacetic acid (D) Methyl chloride

33. Identify Z in the following reaction sequence



- (A)  $CH_3COOH$  (B)  $CH_3MgI$   
(C)  $CH_3COCl$  (D)  $ClCH_2COOH$

34. Ethyl alcohol can be obtained in one step from acetic acid by reduction with -

- (A) Zinc and acetic acid  
(B) Lithium aluminium hydride  
(C) HI and red phosphorus  
(D) Nickel and hydrogen



35. Kolbe's electrolysis of aqueous potassium ethanoate leads to the formation of -  
 (A) Ethene (B) Methane  
 (C) Ethane (D) Ethyne
36. When a bee bites, it mainly injects into body-  
 (A) Formic acid (B) Acetic acid  
 (C) Carbonic acid (D) Hydrochloric acid
37. Carboxylic acids do not give the characteristic properties of -  
 (A) R - group (B) - COOH group  
 (C) > C = O group (D) None is correct
38. In the molecule  $\text{CH}_3\text{CHCl} - \text{CH}_2\text{COOH}$ , Cl atom is attached to -  
 (A)  $\alpha$  - Carbon atom (B)  $\beta$ -Carbon atom  
 (C)  $\gamma$ -Carbon atom (D)  $\omega$ -Carbon atom
39. Which of the following test is not carried out to examine the presence of -COOH groups -  
 (A) Litmus test  
 (B) Sodium bicarbonate test  
 (C) Ester test  
 (D) Bromine water test
40. Reaction of a fat or oil with alkali is called -  
 (A) Esterification (B) Saponification  
 (C) Etherification (D) Epoxidation
41. Which of the following lacks chirality -  
 (A) 2-Hydroxy propanoic acid  
 (B) 2-Aminopropanoic acid  
 (C) 2,3-Butene-dioic acid  
 (D) 2,3-Dihydroxy butanoic acid
42.  $(\text{CH}_3)_2\text{C} = \text{CHCOCH}_3$  can be oxidised to  $(\text{CH}_3)_2\text{C} = \text{CHCOOH}$  by -  
 (A) Chromic acid (B) NaOI  
 (C) Cu at 300 °C (D)  $\text{KMnO}_4$
43. Select the compound which does not give acetic acid on hydrolysis -  
 (A)  $\text{CH}_3\text{CCl}_3$  (B)  $\text{CH}_3\text{CN}$   
 (C)  $\text{CH}_3\text{COCl}$  (D)  $\text{CH}_3\text{CH}_2\text{Cl}$
44. The simplest dicarboxylic acid is -  
 (A) Vinegar acid (B) Carbolic acid  
 (C) Oxalic acid (D) Succinic acid
45. The acid formed when propyl magnesium bromide is treated with  $\text{CO}_2$  is -  
 (A)  $\text{CH}_3\text{CH}_2\text{COOH}$   
 (B)  $\text{C}_3\text{H}_7\text{COOH}$   
 (C)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{COOH}$   
 (D) None
46. Which of the following skeleton gives the strongest acid if COOH is attached to the free valency -  
 (A)  $\begin{array}{c} \text{C} \\ | \\ \text{C} - \text{C} - \end{array}$  (B)  $\text{C} - \text{C} - \text{C} -$   
 (C)  $\text{H} -$  (D)  $\text{C} - \text{C} -$
47.  $\text{A} \xleftarrow[\text{HI}]{\text{red P}} \text{CH}_3\text{COOH} \xrightarrow{\text{LiAlH}_4} \text{B}$ . What is not true for A and B -  
 (A) A is hydrocarbon of general formula  $\text{C}_n\text{H}_{2n+2}$  while B belongs to alkanol  
 (B) A can be obtained by reducing  $\text{CH}_3\text{CH}_2\text{Cl}$  while B by its hydrolysis  
 (C) A is alkene while B is alkanal  
 (D) A and B both belongs to different homologous series
48. The product A, B, C and D in the reaction  $\text{A} + \text{B} \xleftarrow{\text{Heat}} \text{H} - \text{COOH} \xrightarrow[\text{H}_2\text{SO}_4]{\text{Heat}} \text{C} + \text{D}$  are given by the set -  
 (A) CO,  $\text{H}_2\text{O}$ ,  $\text{CO}_2$ ,  $\text{H}_2$   
 (B)  $\text{CO}_2$ ,  $\text{H}_2\text{O}$ , CO,  $\text{H}_2$   
 (C)  $\text{CO}_2$ ,  $\text{H}_2$ , CO,  $\text{H}_2\text{O}$   
 (D) CO,  $\text{H}_2$ ,  $\text{CO}_2$ ,  $\text{H}_2\text{O}$
49. Ozonolysis of fatty acid is carried out to ascertain -  
 (A) Number of -OH group  
 (B) Number of - COOH group  
 (C) Position of carbonyl group  
 (D) Position of double bond
50. Dry distillation of calcium acetate gives -  
 (A) Acetaldehyde (B) Acetone  
 (C) Ethane (D) Propanal

## Carboxylic Acid Derivatives

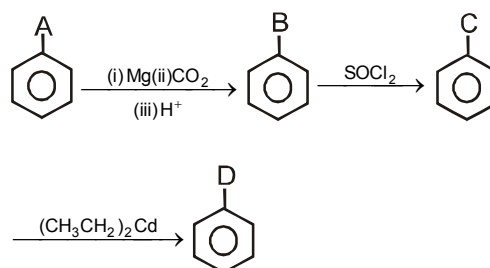
### General Points

- $C_nH_{2n+1}COCl$  represent the general formula of acyl chloride. Unstable member of this family would be obtained if we put -  
 (A)  $n = 1$  (B)  $n = 1/2$   
 (C)  $n = 0$  (D)  $n = 2$
- The molecular formula  $C_3H_5OCl$  represents -  
 (A) 1-Chloropropanone only  
 (B) Propanoyl chloride only  
 (C) 2-Chloropropanal only  
 (D) All are correct
- Propanoyl chloride is isomeric with -  
 (A) Propanol (B) 2-Chloropropanal  
 (C) Dichloroacetone (D) 1-Chloro-2-propanol
- Except one all other names represent the same compound -  
 (A) Ethyl acetoacetate  
 (B) Acetoacetic ester  
 (C) Ethyl-3-oxobutanoate  
 (D) Ethyl-2-ketobutanoate
- The third homologue of methyl esters is -  
 (A) Ethyl acetate (B) Methyl propionate  
 (C) Methyl butyrate (D) Methyl methanoate

### Physical Properties

- The general structure of alkanamides is -  
 (A)  $R - CH_2 - NH_2$  (B)  $(R - CH_2)_2NH$   
 (C)  $R - CH_2 - CONH_2$  (D)  $R - NHCOR$
- The identical C-O bond lengths in carboxylate ions are due to -  
 (A) Resonance  
 (B) Presence of carbonyl group  
 (C) Presence of alkyl group  
 (D) None of these
- The preparation of ethyl acetoacetate involves -  
 (A) Wittig reaction  
 (B) Claisen condensation  
 (C) Reformatsky reaction  
 (D) Cannizzaro's reaction

- Why -OH group in ethyl alcohol is neutral, while it is acidic in acetic acid -  
 (A) In acetic acid -OH group is attached with electronegative carbonyl group  
 (B) Ethyl alcohol molecules get associated  
 (C) Acetic acid has much stronger hydrogen bonding  
 (D) All of these
- The salicylic acid reacts with both the neutral  $FeCl_3$  solution and with  $CH_3OH$  in esterification reaction because it contains -  
 (A) both an acid group and an alcoholic group  
 (B) both an acid group and an aldehydic group  
 (C) both an acid group and a phenolic group  
 (D) both an acid and ester group
- The compound which on reduction with  $LiAlH_4$  gives two alcohols -  
 (A)  $CH_3COOCH_3$  (B)  $CH_3COOC_2H_5$   
 (C)  $CH_3COCH_3$  (D)  $CH_3CHO$
- To acetamide  $NaNO_2$  and dil.  $HCl$  are added. The product obtained is -  
 (A) Nitromethane  
 (B) N-methyl acetamide  
 (C) Acetic acid  
 (D) Acetic anhydride
- Consider the following sequence of reactions-



Identify A, B, C and D :

- | A        | B     | C                  | D  |
|----------|-------|--------------------|--|
| (A) -F   | -COOH | -COCH <sub>3</sub> | -COCH <sub>2</sub> CH <sub>2</sub> CH <sub>3</sub> |
| (B) -CHO | -COOH | -COCl              | -COCH <sub>2</sub> CH <sub>3</sub>                 |
| (C) -Br  | -COOH | -COCl              | -COCH <sub>2</sub> CH <sub>3</sub>                 |
| (D) -Br  | -COOH | -COCl              | -CHO   |
- The -OH group of an alcohol or -COOH gp. of a carboxylic acid can be replaced by Cl using -  
 (A)  $PCl_5$  (B)  $Cl_2$   
 (C)  $HOCl$  (D)  $HCl$

**Chemical Properties**

15. Derivative of a mono carboxylic acid is-
- (A) An acid chloride and amide  
(B) An ester  
(C) An acid anhydride  
(D) All of these
16. Hydrolysis of which one of the following compound is easier -
- (A) Methyl chloride  
(B) Ethanoyl chloride  
(C) Acetamide  
(D) Ethyl acetate
17.  $\text{CH}_3\text{COCl} + \text{C}_2\text{H}_5\text{O} \xrightarrow{\text{Pyridine}} \text{CH}_3\text{COOC}_2\text{H}_5 + \text{HCl}$ .  
The function of pyridine in the above reaction is-
- (A) To absorb liberated HCl  
(B) To catalyse the reaction  
(C) Both the above  
(D) None of the above
18. Most reactive derivative of acetic acid is -
- (A) Acetyl chloride (B) Acetic anhydride  
(C) Acetamide (D) Ethyl acetate
19.  $\text{CH}_3\text{COCl}$  can react with -
- (A)  $\text{C}_6\text{H}_5\text{OH}$  (B)  $\text{C}_6\text{H}_5\text{NH}_2$   
(C)  $\text{C}_6\text{H}_4$   $\begin{matrix} \text{OH} \\ \diagup \\ \text{C}_6\text{H}_4 \\ \diagdown \\ \text{COOH} \end{matrix}$  (ortho) (D) All of these
20. Which of the following pair of compound would be easily hydrolysed. The pair contains one member from the two sets (1 & 2)-
- (1) Acetyl chloride, Acetic anhydride  
(2) Ethyl chloride, Ethyl iodide
- (A) (1) Acetyl chloride (2) Ethyl iodide  
(B) (1) Acetyl chloride (2) Ethyl chloride  
(C) (1) Acetic anhydride (2) Ethyl iodide  
(D) (1) Acetic anhydride (2) Ethyl chloride
21. Which is the correct statement in regards to  $\text{CH}_3\text{COCl}$  -
- (A) It is reduced to  $\text{C}_2\text{H}_5\text{OH}$  by  $\text{LiAlH}_4$   
(B) It is reduced to  $\text{CH}_3\text{CHO}$  when  $\text{H}_2$  is passed into it, in the presence of  $\text{Pd} / \text{BaSO}_4$  in boiling xylene
- (C) It forms ethyl acetate on reaction with -  $\text{C}_2\text{H}_5\text{OH}$   
(D) All of these
22. Acetylchloride is suitable reagent to identify the following group in the organic compound-
- (A)  $\begin{matrix} \text{O} \\ \parallel \\ \text{C} \\ | \\ \text{H} \end{matrix}$  (B)  $> \text{C} = \text{O}$   
(C)  $-\text{OH}$  (D) None of these
23. Acetyl chloride can be converted to acetaldehyde by -
- (A) Its reduction with  $\text{H}_2/\text{Pd}-\text{BaSO}_4$   
(B) Its reduction with  $\text{Ni}/\text{H}_2$   
(C) Its reduction with  $\text{LiAlH}_4$   
(D) Its reduction with  $\text{NaBH}_4$
24. When acetyl chloride reacts with benzene in anhydrous  $\text{AlCl}_3$  the product is-
- (A) Acetophenone (B) Toluene  
(C) Benzophenone (D) None of these
25. Alkaline or acid hydrolysis of  $\text{CH}_3\text{COCl}$  is nothing but -
- (A) Electrophilic substitution  
(B) Nucleophilic substitution  
(C) Free radical substitution  
(D) Biradical substitution
26. The reaction between  $\text{CH}_3\text{COCl}$  and  $\text{KCN}$  followed by hydrolysis yield-
- (A) Acetic acid (B) Acetamide  
(C) Pyruvic acid (D) Methyl isocyanate
27. When acetyl chloride reacts with Grignard's reagent we get -
- (A) Aldehyde (B) Ketone  
(C) Acid (D) Ester
28. Acetyl chloride and sodium azide react to give methylamine. The reaction is called-
- (A) Schimdt reaction  
(B) Kolbe Schmidt reation  
(C) Curtius reaction  
(D) Schotten Baumann reaction
29. Acetylation is the process in which hydrogen is substituted by -
- (A)  $\text{CH}_3 \text{CO} -$  (B)  $\text{CH}_3 \text{CONH} -$   
(C)  $\text{CH}_3 -$  (D) None of these

30. The hybridisation state on Carbon atom of  $-\text{COCl}$  is-
- (A)  $sp$  (B)  $sp^2$   
(C)  $sp^3$  (D) None of these
31. Reaction of ethanol with acetic anhydride is an example of-
- (A) Nucleophilic addition  
(B) Electrophilic addition  
(C) Nucleophilic substitution  
(D) Free radical substitution
32. When the product formed by the reaction of  $\text{HCOOC}_2\text{H}_5$  with an excess of  $\text{CH}_3\text{MgI}$  is hydrolysed, it yields-
- (A) n-Propyl alcohol (B) Isopropyl alcohol  
(C) Propanol (D) Ethanol
33. Acetamide is-
- (A) Acidic (B) Basic  
(C) Amphoteric (D) None of these
34. Amide without  $-\text{CONH}_2$  group is-
- (A) Picramide  
(B)  $\alpha$ -Chloro ethanamide  
(C) Benzamide  
(D) Acetamide
35. The end product in the reaction
- $$\text{CH}_3\text{CONH}_2 \xrightarrow{\text{P}_2\text{O}_5} \text{B} \xrightarrow{4[\text{H}]} \text{C} \xrightarrow{\text{HNO}_2} \text{D}$$
- $$\xrightarrow[300^\circ]{\text{Cu}} \text{E is -}$$
- (A)  $\text{CH}_3\text{CHO}$  (B)  $\text{CH}_3\text{COCH}_3$   
(C)  $\text{CH}_3\text{COOC}_2\text{H}_5$  (D)  $(\text{CH}_3\text{CO})_2\text{O}$
36. The hydrolysis of which of the following takes the longest time -
- (A)  $\text{CH}_3\text{COCl}$  (B)  $\text{CH}_3\text{COOCOCH}_3$   
(C)  $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{OC}_2\text{H}_5$  (D)  $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}_2$
37.  $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{L}$  will be most stable if L is the following group-
- (A)  $\text{NH}_2$   
(B)  $\text{Cl}$   
(C)  $\text{OC}_2\text{H}_5$   
(D) All are equally stable
38. Hofmann degradation is useful for-
- (A) Stepping up any homologous series  
(B) Stepping down any homologous series  
(C) Both the above  
(D) None of the above
39.  $1^\circ$  Nitrile is formed in the reaction-
- (A)  $\text{CH}_3\text{CONH}_2 + \text{SOCl}_2$   
(B)  $\text{CH}_3\text{CONH}_2 + \text{PCl}_5$   
(C)  $\text{CH}_3\text{CONH}_2 + \text{P}_2\text{O}_5$   
(D) In all the above reaction
40. Hofmann bromamide reaction involves the intermediate formation of-
- (A) A species with electron deficient carbon  
(B) A species with electron deficient nitrogen  
(C) A species with negative charge  
(D) A free radical species
41.  $\text{RCOOAg} + \text{Br}_2 \xrightarrow[\Delta]{\text{CCl}_4} \text{R}-\text{Br} + \text{AgBr} + \text{CO}_2$   
This reaction is called -
- (A) Wurtz reaction  
(B) Hunsdiecker reaction  
(C) Friedel - Craft reaction  
(D) Kolbe reaction
42. Which is incorrect in regard to the formation of ester-
- (A) It can be obtained by heating silver acetate and ethyl bromide  
(B) It can be obtained by the action of ethyl alcohol on  $\text{CH}_3\text{COCl}$  or acetic anhydride  
(C) It can be obtained by heating  $\text{CH}_3\text{CHO}$  in presence of aluminium ethoxide  
(D) None of these
43. When acetic acid reacts with ethylene in presence of  $\text{BF}_3$ , we get-
- (A) Ethyl acetate (B) Acetic anhydride  
(C) Methyl alcohol (D) Ethyl alcohol
44. Arrange acetyl chloride (I), ethyl acetate (II), acetamide (III) and acetic anhydride (IV) in order of reactivity towards nucleophilic acyl substitution -
- (A)  $\text{I} > \text{IV} > \text{II} > \text{III}$  (B)  $\text{I} > \text{II} > \text{III} > \text{IV}$   
(C)  $\text{III} > \text{II} > \text{IV} > \text{I}$  (D)  $\text{IV} > \text{III} > \text{II} > \text{I}$

45. Reaction between  $\text{CH}_2 = \text{C} = \text{O}$  and  $\text{C}_2\text{H}_5\text{OH}$  forms-
- (A) Methyl acetate (B) Methyl formate  
(C) Ethyl acetate (D) Acetic acid
46. Synthetic flavours contain -
- (A) Unsaturated acids (B) Esters  
(C) Dicarboxylic acids (D) Hydroxy acid
47. The reaction,  $\text{CH}_3\text{COOC}_2\text{H}_5 \xrightarrow[4[\text{H}]]{\text{Na} + \text{C}_2\text{H}_5\text{OH}}$   $\text{C}_2\text{H}_5\text{OH} + \text{CH}_3\text{CH}_2\text{OH}$ , is called -
- (A) Claisen reduction  
(B) Claisen condensation  
(C) Bouveault-Blanc reduction  
(D) Tischenko reduction
48. The reaction of acetaldehyde in the presence of  $\text{Al}(\text{OC}_2\text{H}_5)_3$  produces -
- (A)  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CHO}$   
(B)  $\text{CH}_3\text{CH} = \text{CH} - \text{CHO}$   
(C)  $\text{CH}_3\text{COOC}_2\text{H}_5$   
(D) No reaction
49. Which of the following is not an inorganic acid ester -
- (A) Dimethyl sulphate (B) Ethyl nitrate  
(C) Nitroglycerine (D) Ethyl orthoformate
50. An organic compound gives a fruity smell. The compound on distillation in presence of dilute alkali yields a product capable of giving positive iodoform test. Hence the compound is -
- (A) Methyl formate (B) Isopropyl acetate  
(C) Methyl propionate (D) n-Propyl formate
51. Acetic anhydride reacts with nitrogen pentoxide to form -
- (A) Nitroacetic acid (B) Acetonitrile  
(C) Acetyl nitrate (D) Acyl nitrene
52. The reaction  $\text{CH}_3\text{CONH}_2 \xrightarrow{\text{NaOBr}}$ , gives -
- (A)  $\text{CH}_3\text{Br}$  (B)  $\text{CH}_4$   
(C)  $\text{CH}_3\text{OBr}$  (D)  $\text{CH}_3\text{NH}_2$
53. An aliphatic carboxylic acid of molecular formula  $\text{C}_2\text{H}_4\text{O}_2$  on reaction with  $\text{PCl}_5$  gives a compound Y. Y when heated with sodium salt of the acid produces-
- (A) Ethyl acetate (B) Ethyl acetoacetate  
(C) Methyl methanoate (D) Ethanoic anhydride
54. Detaching H atom from the carboxylic acid, the remainder portion is called-
- (A) Acyl group (B) Acetyl group  
(C) Acyl oxy group (D) None of these
55. The electronegativity order of Y in :  $\text{R} - \overset{\text{O}}{\parallel}{\text{C}} - \text{Y}$  is-
- (A)  $-\text{OR}' > -\text{NH}_2 > -\text{Cl} > \text{OCOR}$   
(B)  $-\text{OCOR} > -\text{Cl} > -\text{OR}' > -\text{NH}_2$   
(C)  $-\text{OCOR} > -\text{OR}' > -\text{Cl} > -\text{NH}_2$   
(D)  $-\text{Cl} > -\text{OCOR} > -\text{OR}' > -\text{NH}_2$

## Benzoic Acid

### General Method of Preparation

- The product obtained by the chlorination of toluene in the presence of light and heat is hydrolysed with aq. NaOH to form -
- (A) o-Cresol  
(B) p-Cresol  
(C) 2,4 Dihydroxy toluene  
(D) Benzoic acid
- The product formed by the reaction of sodium formate with sodium benzene sulphonate is -
- (A)  $\text{C}_6\text{H}_5\text{OH} + \text{Na}_2\text{SO}_3$   
(B)  $\text{C}_6\text{H}_5\text{ONa} + \text{NaHSO}_3$   
(C)  $\text{C}_6\text{H}_5\text{COOH} + \text{Na}_2\text{SO}_3$   
(D) Reaction does not occur
  - The product obtained by oxidation of toluene with  $\text{HNO}_3$  is -

(A) Benzaldehyde (B) Benzoic acid  
(C) Nitrotoluene (D) Phenol

  - $\text{H} \xleftarrow{\text{O}_2} \text{Benzaldehyde} \xrightarrow{\text{NH}_3} \text{H} \quad \text{H} \quad \text{H}$  are -

(A) Benzoic acid, Benzaldehyde ammonia  
(B) Benzoic acid, Hydrobenzamide  
(C) Phenyl acetic acid, Benzaldehyde ammonia  
(D) Benzoic acid, Aniline

  - Decarboxylation of which of the following acid gives benzoic acid -

(A) Phthalic acid (B) Anthranilic acid  
(C) Phenylacetic acid (D) Malic acid

6. When toluene is treated with acidic  $\text{KMnO}_4$ , we get—  
 (A) Benzoic acid (B) Benzyl alcohol  
 (C) Benzaldehyde (D) Benzene
7. Benzoic acid is not the product of which of the following reactions —  
 (A)  $\text{C}_6\text{H}_5\text{CCl}_3 + 2\text{H}_2\text{O} \xrightarrow{\text{Ca(OH)}_2 + \text{Fe}}$   
 (B)  $\text{C}_6\text{H}_6 + \text{COCl}_2 \xrightarrow{\text{(i) AlCl}_3 \text{ (ii) H}_3\text{O}^+}$   
 (C)  $\text{C}_6\text{H}_5\text{CH}_3 \xrightarrow{\text{KMnO}_4 + \text{OH}^-}$   
 (D)  $\text{C}_6\text{H}_5\text{OH} \xrightarrow{\text{MnO}_2, \text{H}_2\text{SO}_4, 40^\circ}$
8. What happens when sodium benzene sulphonate is fused with sodium formate —  
 (A)  $\text{C}_6\text{H}_5\text{COOH} + \text{Na}_2\text{SO}_3$   
 (B)  $\text{C}_6\text{H}_5\text{OH} + \text{Na}_2\text{SO}_3$   
 (C)  $\text{C}_6\text{H}_5\text{CH}_2\text{OH} + \text{Na}_2\text{SO}_3$   
 (D)  $\text{C}_6\text{H}_4 \begin{matrix} \text{OH} \\ \text{COOH} \end{matrix} + \text{Na}_2\text{SO}_3$
9. In the preparation of  $\text{C}_6\text{H}_5\text{COOH}$  and  $\text{CH}_3\text{COOH}$ , which method is equally applicable to both —  
 (A) Grignard reagent and dry ice  
 (B) Hydrolysis of esters  
 (C) Hydrolysis of nitriles  
 (D) All the above
10. Which of the following reaction gives different product than the other three —  
 (A)  $\text{C}_6\text{H}_5\text{CH}_3 \xrightarrow[\text{ii) H}_2\text{O}]{\text{i) CrO}_2\text{Cl}_2}$   
 (B)  $\text{C}_6\text{H}_6 + \text{CO} + \text{HCl} \xrightarrow[\text{AlCl}_3]{\text{anhydrous}}$   
 (C)  $\text{C}_6\text{H}_5\text{COCl} + \text{H}_2 \xrightarrow{\text{Pd/BaSO}_4}$   
 (D)  $\text{C}_6\text{H}_5 - \text{CH}(\text{CH}_3)_2 \xrightarrow[\text{H}^+]{\text{MnO}_4^-}$
12. Which of the following dissolves in hot water easily —  
 (A) Benzoic acid (B) Benzaldehyde  
 (C) Aniline (D) Phenol
13. Benzoic acid has higher molecular weight in benzene and less in water because —  
 (A) Water has lower freezing point and higher boiling point than benzene  
 (B) It dissociates to a greater extent in benzene than in water  
 (C) It associates in water and dissociates in benzene  
 (D) It dissociates in water and associates in benzene

### Chemical Properties

14. A mixture of benzene and benzoic acid is separated by the following reagent —  
 (A) Toluene (B)  $\text{NaHCO}_3$   
 (C)  $\text{HCl}$  (D) Diethyl ether
15. The compounds (a)  $\phi\text{-CH}_2\text{OH}$ , (b)  $\phi\text{-OH}$ , (c)  $\phi\text{-COOH}$  are all capable of acting as acid under some conditions. Which of the following lists them in order of increasing acid strength —  
 (A) c, a, b (B) b, c, a  
 (C) a, b, c (D) b, a, c
16. The acid strength of benzoic acid is affected by introducing a substituent in the ring —  
 (A) By the nature of the substituent  
 (B) By the position of the substituent in the ring  
 (C) Both the above  
 (D) The acid strength always increases by the substituent
17. Decreasing order of acidity of p-methoxy benzoic acid (A), p-nitrobenzoic acid (B) and benzoic acid (C) is —  
 (A) B, C, A (B) A, B, C  
 (C) C, A, B (D) None
18. Benzoic acid reacts with  $\text{Ca(OH)}_2$ . The product obtained on dry distillation gives —  
 (A) Benzophenone (B) Acetophenone  
 (C) Benzaldehyde (D) None of these
19. The product of the reaction of benzoic acid with  $\text{SOCl}_2$  is —  
 (A) Chlorobenzene (B) Dichlorobenzene  
 (C) Benzoyl chloride (D) Benzyl chloride

### Physical Properties

11. The molecular weight of benzoic acid in benzene was found to be twice. The reason is —  
 (A) Resonance (B) Dimer formation  
 (C) Aromatic sheet (D) None

20. The acid which does not form an anhydride when treated with  $P_2O_5$  is –  
 (A) Formic acid (B) Acetic acid  
 (C) Propionic acid (D) Benzoic acid
21.  $C_6H_5COOH + A \xrightarrow{\text{conc. } H_2SO_4} N_2 + CO_2 + C_6H_5NH_2$   
 The above reaction is a Schmidt reaction. Here A is –  
 (A) Polyprotic acid (B) Monobasic acid  
 (C) Monoacid base (D) None
22.  $? \xrightarrow[\text{EtOH, } H_2O]{\Delta, CN^-} \text{Benzoin}$   
 The reactant is obtained by dry distillation of the calcium salts of the following pairs –  
 (A)  $C_6H_5CH_2COOH, HCOOH$   
 (B)  $C_6H_5COOH, HCOOH$   
 (C)  $C_6H_4(OH)COOH, HCOOH$   
 (D)  $C_6H_4(NH_2)COOH, HCOOH$
23. Aromatic ketones formed by the dry distillation of  $(C_6H_5COO)_2Ca$  and  $(C_6H_5CH_2COO)_2Ca$  would be –  
 (A) 1 (B) 2  
 (C) 3 (D) 4
24. The following compound is obtained by the reduction of benzoic acid with lithium aluminium hydride –  
 (A) Cyclohexanoic acid  
 (B) Benzylalcohol  
 (C) Cyclohexa-1, 4-dioic acid  
 (D) No reaction



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## MISCELLANEOUS QUESTIONS

- Acetaldehyde, on being heated with conc.  $H_2SO_4$  at 273 K, gives:
  - Acetic acid
  - Paraldehyde
  - Metalddehyde
  - None of these
- In the reaction sequence:
 
$$CH_3-C\equiv CH \xrightarrow{Dil. H_2SO_4, Hg^{+2}} A \xrightarrow{CHCl_3} B$$

$$I_2 + NaOH \downarrow$$

$$C$$
 A, B and C are given by the set:
  - $CH_3CH_2CHO$ ,  $CH_3CH_2CH_2Cl$ ,  $CHI_3$ .
  - $CH_3COCH_3$ ,  $CCl_3-C(CH_3)_2$ ,  $CHI_3$
  - $CH_3COCH_3$ ,  $CCl_3-C(CH_3)_2$ ,  $CHI_3$ .
  - $CH_3CH_2CHO$ ,  $CCl_3-CH(OH)-CH_2-CH_3$ ,  $CHI_3$ .
- On being treated with HCl, acetone gives:
  - Mesityl oxide
  - Phoron
  - Mesitylene
  - Aldol
- Ethyl cyanide is allowed to react with methylmagnesium iodide and subsequently acidified with dilute HCl. The product formed is -
  - propanone
  - propanal
  - butanal
  - butanone
- Which of the following alkenes is most suitable for the preparation butanone by ozonolysis -
  - 
  - 
  - 
  -
- In the reaction  $CH_3CHO + HCN \rightarrow CH_3CHOHCN$  the product obtained is -
  - a meso compound
  - a levorotatory compound
  - a dextrorotatory compound
  - a racemic mixture
- Consider the following sequence of reactions
 
$$CH_3C\equiv CH \xrightarrow[Hg^{2+}]{H_3O^+} A \xrightarrow[2.H_2O]{1.CH_3MgI} B$$
 The final product (B) is -
  - $CH_3C\equiv CCH_3$
  - $CH_3COCH_2CH_3$
  - $CH_3CH_2CHOHCH_3$
  - $(CH_3)_3C-OH$
- Cannizzaro reaction does not take place with -
  - $(CH_3)_3CCHO$
  - 
  - 
  - $CH_3CHO$
- Bakelite, a polymer, is formed by either acid or base-catalysed condensation of formaldehyde with -
  - benzaldehyde
  - 2-naphthol
  - phenol
  - acetaldehyde
- In the reaction  $CH_3COCH_3 + SeO_2 \rightarrow P + Se + H_2O$  the product (P) is -
  - $CH_3COOCH_3$
  - $CH_3COOCH_2OH$
  - $CH_3COCHO$
  - $CH_3OCOOCH_3$
- The reagent that can be used to distinguish acetophenone and benzophenone is -
  - 2, 4-dinitrophenylhydrazine
  - aqueous  $NaHSO_3$
  - Benedict's reagent
  - $I_2$  and  $Na_2CO_3$
- An alkene  $C_7H_{14}$  on reductive ozonolysis gives an aldehyde with formula  $C_3H_6O$  and a ketone. The ketone is -
  - 2-butanone
  - 2-pentanone
  - 3-pentanone
  - propanone
- Identify the compounds A and B in the following reaction sequence
 
$$(CH_3)_2C=O \xrightarrow[HCl]{NaCN} a \xrightarrow[Heat]{H_3O^+} b$$
  - a =  $CH_3CO_2H$ , b =  $(CH_3CO)_2O$
  - a =  $(CH_3)_2C(OH)CN$ , b =  $(CH_3)_2C(OH)CO_2H$
  - a =  $CH_3CHO$ , b =  $CH_3CO_2H$
  - a =  $(CH_3)_2C(OH)CN$ , b =  $(CH_3)_2C=O$



14. Nucleophilic addition reaction will be most favoured in -

(A)  $\text{CH}_3\text{CHO}$

(B)  $\text{CH}_3\text{-CH}_2\text{-CH}_2\overset{\text{O}}{\parallel}\text{C-CH}_3$

(C)  $(\text{CH}_3)_2\text{C}=\text{O}$

(D)  $\text{CH}_3\text{CH}_2\text{CHO}$

15. The increasing order of the rate of HCN addition to compounds a - d is -

(a) HCHO

(b)  $\text{CH}_3\text{COCH}_3$

(d) PhCOCH<sub>3</sub>

(d) PhCOPh

(A)  $a < b < c < d$

(B)  $d < b < c < a$

(C)  $d < c < b < a$

(D)  $d < a < c < b$

16. Benzamide on heating with bromine and caustic alkali gives -

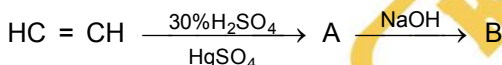
(A) benzene

(B) methyl amino and benzene

(C) aniline

(D) m-Bromo-benzaldehyde

17. Predict the product 'B' in the sequence of reaction



(A)  $\text{CH}_3\text{COONa}$

(B)  $\text{CH}_3\text{COOH}$

(C)  $\text{CH}_3\text{CHO}$

(D)  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CHO}$

18. Which one of the following on treatment with 50% aqueous sodium hydroxide yields the corresponding alcohol and acid -

(A)  $\text{CH}_3\text{COCH}_3$

(B)  $\text{C}_6\text{H}_5\text{CH}_2\text{CHO}$

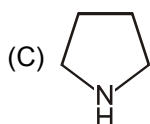
(C)  $\text{C}_6\text{H}_5\text{CHO}$

(D)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$

19. Among the following compounds which one will react with acetone to give a product that contains carbon-nitrogen double bond -

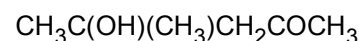
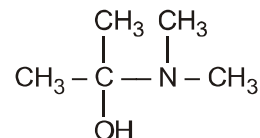
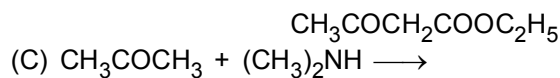
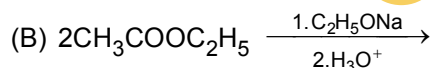
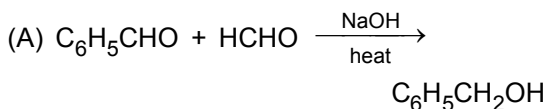
(A)  $\text{C}_6\text{H}_5\text{NHC}_6\text{H}_5$

(B)  $(\text{CH}_3)_3\text{N}$



(D)  $\text{C}_6\text{H}_5\text{NHNH}_2$

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



21. Benzaldehyde reacts with ammonia to form -

(A) Aniline

(B) Benzamide

(C) Hydrobenzamide

(D) Phenyl cyanide

22. Which one of the following reactant can be used to distinguish between benzaldehyde and benzyl alcohol -

(A)  $\text{KMnO}_4$  / oxidation

(B)  $\text{CrO}_3$  / oxidation

(C) Sodium metal

(D) Flame test

23. What are the products formed when a mixture of benzaldehyde and formaldehyde is heated with conc. alkali -

(A) Benzyl alcohol and formic acid

(B) Only benzyl alcohol

(C) Methyl alcohol and benzoic acid

(D) Only methyl alcohol

24. Which of the following compounds will react with ethanolic KCN -

(A)  $\text{C}_6\text{H}_5\text{OH}$

(B)  $\text{CH}_3\text{COCl}$

(C)  $\text{C}_6\text{H}_5\text{CHO}$

(D)  $\text{C}_6\text{H}_5\text{COOH}$

25. Benzaldehyde is used in all except -

(A) In the manufacture of perfuming agents

(B) As an oxidising agent

(C) In the manufacture of dyes

(D) In the manufacture of cosmetics

26. Benzylidene acetone is the product of the reaction of an organic compound (A) with acetone in the presence of ethanolic sodium hydroxide. The organic compound (A) is -

(A) Benzylalcohol

(B) Benzaldehyde

(C) Benzoic acid

(D) Acetophenone

27. Which of the following is most stable -

(A)  $\text{C}_6\text{H}_5\text{COO}^-$

(B)  $\text{CH}_3\text{COO}^-$

(C)  $\text{C}_6\text{H}_5\text{COOH}$

(D)  $\text{CH}_3\text{COOH}$

28.  $C_6H_5CHO \xrightarrow{NH_2OH}$  An oxime  $\xrightarrow{H_2O}$  A.  
The V. D. of A should be –  
(A) 53 (B) 52  
(C) 51 (D) 50
29. Replacement of carbonylic oxygen is observed in the reaction –  
(A)  $C_6H_5CHO/2H$   
(B)  $C_6H_5CHO/H_2N - NH_2$   
(C)  $C_6H_5COOH/PCl_5$  (D)  $C_6H_5CHO/HCN$
30. Use is made of the following reagent to convert benzaldehyde to benzoyl chloride –  
(A) Phosphorus pentachloride  
(B) Thionyl chloride  
(C) Reaction with chlorine in presence of  $AlCl_3$  (D) Reaction with  $Cl_2$
31. Benzyl phenyl ketone is –  
(A)  $C_6H_5COC_6H_5$   
(B)  $C_6H_5 - CO - CO - C_6H_5$   
(C)  $C_6H_5CH_2 - CO - C_6H_5$   
(D)  $C_6H_5CH_2 - CO - CH_2 - C_6H_5$
32. The following compound is obtained on refluxing benzaldehyde with aqueous ethanolic potassium cyanide –  
(A) Benzoic acid (B) Benzyl acetate  
(C) Cinnamic acid (D) Benzoin
33. An organic compound contains 40% C and 6.66% H. Its empirical formula is –  
(A)  $CH_2$  (B)  $CH_2O$   
(C)  $CHO$  (D)  $CHO_2$
34. Choose the wrong statement –  
(A) Smell of benzaldehyde and mirbane oil is not different  
(B) Benzaldehyde undergoes Tischenko reaction  
(C) Benzaldehyde reduces Fehling's solution  
(D) Dry distillation of calcium benzoate gives a ketonic compound
35. Etard reaction in the following is –  
(A) Oxidation of toluene to benzaldehyde by chromylchloride  
(B) Oxidation of toluene to benzaldehyde by alkaline  $KMnO_4$   
(C) Dry distillation of calcium benzoate  
(D) Reaction of benzene with  $Cl_2$  in the presence of ultra violet light.
36.  $C_6H_6 \xrightarrow[\text{Dry } AlCl_3]{CH_3Cl} C_6H_5CH_3 \xrightarrow{CrO_2Cl_2}$   
 $C_6H_5CHO \xrightarrow[NaOH]{CH_3CHO} C_6H_5CH = CHCOOH$   
The reactions involved in the above reaction sequence are –  
(A) Friedel Craft, Gattermann, Aldol condensation  
(B) Friedel Craft, Etard, Claisen condensation  
(C) Friedel Craft, Sommler, Claisen condensation  
(D) Friedel Craft, Sommler, Aldol condensation
37. Replacement of carbonyl oxygen takes place in the reaction –  
(A) Benzaldehyde + Hydroxylamine  
(B) Benzaldehyde + Phenylhydrazine  
(C) Benzaldehyde + Phosphorus pentachloride  
(D) In all the above reactions
38. Aromatic aldehydes react with primary amines to form the following –  
(A) Urea (B) Amide  
(C) Schiff's base (D) Oxime
39. Which aldehyde is used in the manufacture of perfumes –  
(A) Cinnamaldehyde (B) Benzaldehyde  
(C) Propionaldehyde (D) Acrylaldehyde
40. Reaction  
 $C_6H_5COCl + H_2 \longrightarrow C_6H_5CHO + HCl$   
occurs in the presence of –  
(A)  $Zn/HCl$  (B)  $AlCl_3$   
(C)  $Pd/BaSO_4$  (D)  $Ni/Pt$
41.  $CH_3 - \overset{\overset{CH_3}{|}}{C} - COOH + Br_2 \xrightarrow[\Delta]{red P} [ \text{Product} ]$   
The product of the above reaction is -  
(A)  $\beta$ -Dibromo acid  
(B)  $\beta, \beta'$  - Dibromo acid  
(C)  $\beta, \beta', \beta''$ -Tribromo acid  
(D) No reaction takes place

42. HVZ reaction is specific for -  
 (A) Replacement of  $\beta$  - hydrogen  
 (B) Replacement of  $\alpha$  - hydrogen  
 (C) Replacement of  $\beta$  - carbons  
 (D) Replacement of  $\alpha$  - carbons
43. Bifunctional organic compound is -  
 (A) HCOOH (B) CH<sub>3</sub>COOH  
 (C) (CH<sub>3</sub>)<sub>2</sub>CO (D) HCHO
44. Acetic acid vapours when passed over aluminium phosphate forms -  
 (A) CH<sub>3</sub>CHO (B) Ketene  
 (C) C<sub>2</sub>H<sub>6</sub> (D) C<sub>2</sub>H<sub>4</sub>
45. The rate of esterification of acetic acid with methyl alcohol (I), ethyl alcohol (II), isopropyl alcohol (III) and tert. butyl alcohol (IV) follows in the order -  
 (A) I > II > III > IV (B) IV > III > II > I  
 (C) II > I > IV > III (D) III > IV > I > III
46. Arrange the following compounds in decreasing order of acidity -  
 I. ClCH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>COOH  
 II. CH<sub>3</sub>CHClCH<sub>2</sub>COOH  
 III. CH<sub>3</sub>CH<sub>2</sub>CHClCOOH  
 (A) I > II > III (B) III > II > I  
 (C) I > III > II (D) III > I > II
47. Arrange OHCH<sub>2</sub>COOH ( I ), HOCH<sub>2</sub>CH<sub>2</sub>COOH (II) and CH<sub>3</sub>COOH ( III ) in order of acidity -  
 (A) I > II > III (B) III > II > I  
 (C) I > III > II (D) II > III > I
48. The rate of esterification of HCOOH (I), CH<sub>3</sub>COOH (II), (CH<sub>3</sub>)<sub>2</sub>CHCOOH (III) and (CH<sub>3</sub>)<sub>3</sub>CCOOH (IV) with ethanol follows in the order -  
 (A) IV > III > II > I (B) I > II > III > IV  
 (C) II > I > IV > III (D) III > IV > I > II
49. X and Y in the reaction sequence R - C  $\equiv$  N  $\xrightarrow{H_3O^+}$  X  $\xrightarrow{\text{diazomethane}}$  Y, are given by the set -  
 (A) Carboxamide, Carbonitrile  
 (B) Carboxylic acid, Carbonitrile  
 (C) RCOOH, RCOOCH<sub>3</sub>  
 (D) RCONH<sub>2</sub>, RCOCH<sub>3</sub>
50. In the electrolysis of the aqueous solution of CH<sub>3</sub>CH<sub>2</sub>COONa, anion goes to anode the possibility of formation of following compounds takes place -  
 (A) CH<sub>3</sub> - CH<sub>2</sub> - CH<sub>2</sub> - CH<sub>3</sub>  
 (B) CH<sub>2</sub> = CH<sub>2</sub>, CH<sub>3</sub> - CH<sub>3</sub>  
 (C) CH<sub>3</sub>CH<sub>2</sub>COOC<sub>2</sub>H<sub>5</sub>  
 (D) All the above
51. Which of the following organic acid decolourises bromine water as well as forms anhydride -  
 (A) HOOC - COOH  
 (B) HOOC - CH<sub>2</sub> - COOH  
 (C)  $\begin{array}{c} \text{H} - \text{C} - \text{COOH} \\ \parallel \\ \text{H} - \text{C} - \text{COOH} \end{array}$   
 (D)  $\begin{array}{c} \text{H} - \text{C} - \text{COOH} \\ \parallel \\ \text{HOOC} - \text{C} - \text{H} \end{array}$
52. The general formula of dicarboxylic acid is -  
 (A) (COOH)<sub>2</sub>  
 (B) (CH<sub>2</sub>)<sub>n</sub>(COOH)<sub>2</sub>  
 (C) (CH<sub>2</sub>)<sub>n-2</sub>(COOH)<sub>2</sub>  
 (D) (CH<sub>2</sub>)<sub>n-1</sub>(COOH)<sub>2</sub>
53. The product A, B and C in the reaction sequence  

$$\begin{array}{c} \text{H} - \text{C} - \text{O} \\ \parallel \\ \text{O} \end{array} \text{Ca} \xrightarrow{\Delta} \text{A} \xrightarrow{\text{NaOH}} \text{B}$$

$$\xrightarrow[360^\circ\text{C}]{\text{Heat}} \text{C}$$
 are -  
 (A) HCHO, HCOONa, CH<sub>3</sub>OH  
 (B) HCHO, Na<sub>2</sub>CO<sub>3</sub>, NaHCO<sub>3</sub>  
 (C) HCHO, HCOONa, (COONa)<sub>2</sub>  
 (D) HCHO, HCOONa, Na<sub>2</sub>CO<sub>3</sub>
54. R - CH<sub>2</sub> - CH<sub>2</sub>OH can be converted into RCH<sub>2</sub>CH<sub>2</sub>COOH. The correct sequence of reagent is  
 (A) PBr<sub>3</sub>, KCN, H<sup>+</sup> (B) PBr<sub>3</sub>, KCN, H<sub>2</sub>  
 (C) KCN, H<sup>+</sup> (D) HCN, PBr<sub>3</sub>, H<sup>+</sup>
55. The correct order of decreasing acid strength of trichloroacetic acid (a), trifluoroacetic acid (b), acetic acid (c), and formic acid (d) is -  
 (A) a > b > c > d (B) a > c > b > d  
 (C) b > a > d > c (D) b > d > c > a

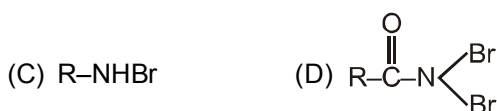
56. Which of the following compounds will react with  $\text{NaHCO}_3$  solution to give sodium salt and carbon dioxide -  
 (A) Acetic acid (B) n-Hexanol  
 (C) Phenol (D) Both (B) and (C)
57. Which of the following statements are false about  $\text{HCOOH}$  -  
 (A) It is a stronger acid than  $\text{CH}_3\text{COOH}$   
 (B) It forms formyl chloride with  $\text{PCl}_5$   
 (C) It gives  $\text{CO}$  and  $\text{H}_2\text{O}$  on heating with conc.  $\text{H}_2\text{SO}_4$   
 (D) It reduces Tollen's reagent
58. The only acid which contains a carboxylic group is -  
 (A) Sulphanilic acid (B) Picric acid  
 (C) Carbonic acid (D) Glycine
59. Which of the following acid does not form anhydride -  
 (A) Formic acid (B) Acetic acid  
 (C) Propanoic acid (D) Phthalic acid
60. In a set of the given reactions, acetic acid yields a product C -  

$$\text{CH}_3\text{COOH} + \text{PCl}_5 \rightarrow \text{A} \xrightarrow[\text{Anhy. AlCl}_3]{\text{C}_6\text{H}_6} \text{B} \xrightarrow[\text{Ether}]{\text{C}_2\text{H}_5\text{MgBr}} \text{C}$$
 Product C would be -  
 (A)  $\text{CH}_3\text{CH}(\text{OH})\text{C}_2\text{H}_5$  (B)  $\text{CH}_3\text{COC}_6\text{H}_5$   
 (C)  $\text{CH}_3\text{CH}(\text{OH})\text{C}_6\text{H}_5$  (D)  $\text{CH}_3-\overset{\text{C}_2\text{H}_5}{\underset{|}{\text{C}}}-\text{C}_6\text{H}_5$
61. Ammonium acetate on heating gives -  
 (A)  $\text{N}_2$  gas (B) acetic acid  
 (C) Acetamide (D)  $\text{NH}_3$  gas
62. The reaction of acetamide with bromine and caustic potash gives -  
 (A) ethylamine (B) methylamine  
 (C) acetic acid (D) bromoacetic acid
63. Hofmann bromamide or hypobromite reaction is given by -  
 (A) amines (B) esters  
 (C) alcohols (D) amides
64. Alkaline hydrolysis of an esters is called -  
 (A) neutralisation (B) esterification  
 (C) polymerisation (D) saponification
65. The compound which is widely used as acetylating agent is -  
 (A) glacial acetic acid  
 (B) ethyl acetate  
 (C) acetic anhydride  
 (D) anhydrous sodium acetate
66. When acetyl chloride reacts with any amine, the reaction is known as -  
 (A) saponification (B) estrification  
 (C) acetylation (D) condensation
67. The end product in the following series of reactions is -  

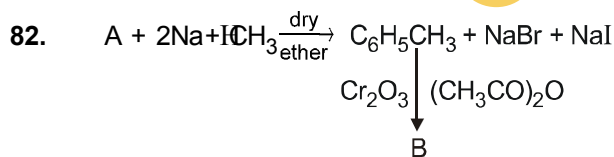
$$\text{CH}_3\text{COOH} \xrightarrow{\text{NH}_3} \text{(A)} \xrightarrow{\text{Heat}} \text{(B)} \xrightarrow{\text{P}_2\text{O}_5} \text{(C)}$$
 (A)  $\text{CH}_4$  (B)  $\text{CH}_3\text{OH}$   
 (C) acetonitrile (D) ammonium acetate
68. The end product in the following sequence is -  

$$\text{Acetamide} \xrightarrow{\text{P}_2\text{O}_5} \text{(A)} \xrightarrow{4\text{H}} \text{(B)}$$
 (A)  $\text{CH}_3\text{NH}_2$  (B)  $\text{C}_2\text{H}_5\text{NH}_2$   
 (C)  $\text{CH}_3\text{CN}$  (D)  $\text{CH}_3\text{COONH}_4$
69. Acetoacetic ester is made by the process of -  
 (A) estrification (B) condensation  
 (C) polymerisation (D) isomerisation
70. Main product of the reaction,  

$$\text{CH}_3\text{CONH}_2 + \text{HNO}_2 \rightarrow \text{is -}$$
 (A)  $\text{CH}_3\text{NH}_2$  (B)  $\text{CH}_3\text{CH}_2\text{NH}_2$   
 (C)  $\text{CH}_3\text{COOH}$  (D)  $\text{CH}_3\text{OH}$
71. The percentage of nitrogen in urea is -  
 (A) 46 (B) 23  
 (C) 48 (D) 52
72. The transformation of ammonium cyanate into urea on heating is -  
 (A) catalytic change  
 (B) thermal decomposition  
 (C) thermal dissociation  
 (D) isomeric change
73. The reaction of  $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}_2$  with a mixture of  $\text{Br}_2$  and  $\text{KOH}$  gives  $\text{R}-\text{NH}_2$  as a product. The intermediates involved in this reaction are -  
 (A)  $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{NHBr}$  (B)  $\text{R}-\text{N}=\text{C}=\text{O}$

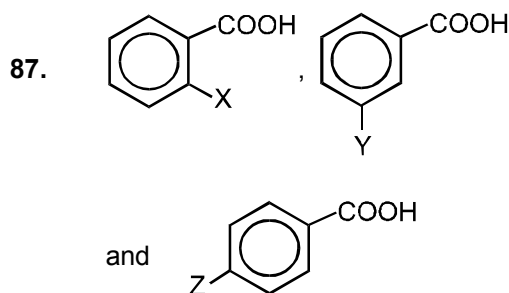


74. Acetic anhydride reacts with  $\text{PCl}_5$  to give-
- (A)  $\text{CH}_3\text{Cl} + \text{H}_3\text{PO}_3$   
 (B)  $\text{CH}_3\text{COCl} + \text{POCl}_3$   
 (C)  $\text{CH}_3\text{COOC}_2\text{H}_5 + \text{PCl}_3$   
 (D)  $\text{CH}_3\text{COCH}_3 + \text{POCl}_3$
75. Acetic anhydride reacts with dimethyl amine to form -
- (A) acetamide  
 (B) N-methyl acetamide  
 (C) N, N-dimethyl acetamide  
 (D) dimethyl acetate
76. Acetic anhydride on reduction with  $\text{LiAlH}_4$  in ether gives -
- (A) acetaldehyde (B) ethyl alcohol  
 (C) acetone (D) ethane
77. Acetic anhydride is used -
- (A) as an acetylating agent  
 (B) for the detection and estimation of  $-\text{OH}$  and  $-\text{NH}_2$  groups  
 (C) in the manufacture of aspirin  
 (D) all of the above
78. By treating acetic acid with an ethereal solution of diazomethane, it forms -
- (A) Methyl acetate (B) ethyl acetate  
 (C) acetamide (D) acetic anhydride
79. Among the given compounds, the most susceptible to nucleophilic attack at the carbonyl group is -
- (A)  $\text{MeCOOCOMe}$  (B)  $\text{MeCHO}$   
 (C)  $\text{MeCOOMe}$  (D)  $\text{MeCOCl}$
80. Esterification is fastest in case of -
- (A)  $\text{CH}_3\text{COOH}$  (B)  $\text{HCOOH}$   
 (C)  $\text{CH}_3\text{CH}_2\text{COOH}$  (D)  $(\text{CH}_3)_2\text{CHCOOH}$
81. Chlorine reacts with benzoic acid in presence of halogen carrier -
- (A) Benzoyl chloride (B) Benzal chloride  
 (C) m-Chlorobenzoic acid  
 (D) o- & p-Chlorobenzoic acid



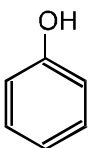
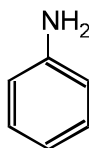
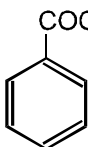
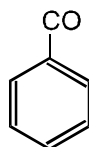
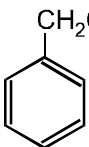
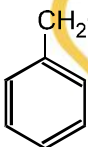
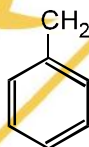
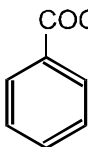
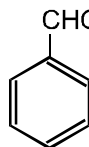
Identify A and B -

- (A) A is  $\text{C}_6\text{H}_5\text{Cl}$  and B is  $\text{C}_6\text{H}_5\text{COOH}$   
 (B) A is  $\text{C}_6\text{H}_5\text{Br}$  and B is  $\text{C}_6\text{H}_5\text{COOH}$   
 (C) A is  $\text{C}_6\text{H}_5\text{Cl}$  and B is  $\text{C}_6\text{H}_5\text{CHO}$   
 (D) A is  $\text{C}_6\text{H}_5\text{Br}$  and B is  $\text{C}_6\text{H}_5\text{CHO}$
83. Which of the following groups will decrease the acidity of benzoic acid -
- (A)  $-\text{OH}$  (B)  $-\text{CH}_3$   
 (C)  $-\text{OCH}_3$  (D) All
84. Benzoic acid is formed by the oxidation of -
- (A) Toluene (B) Ethylbenzene  
 (C) Benzyl chloride (D) All of these
85. Sulphonation of benzoic acid produces mainly-
- (A) o-Sulphobenzoic acid  
 (B) m-Sulphobenzoic acid  
 (C) p-Sulphobenzoic acid  
 (D) o- and p-Sulphobenzoic acids
86. Benzoic acid gives benzene on being heated with X and phenol gives benzene on being heated with Y. Therefore, X and Y are respectively -
- (A) Soda lime and copper  
 (B) Zn dust and NaOH  
 (C) Zn dust and soda lime  
 (D) Soda lime and zinc dust



When heated with sodalime gives phenol, but benzoic acid when heating is done with zinc dust. Here X, Y and Z are -

- (A)  $\text{X} = \text{Y} = \text{Z} = \text{OH}$  (B)  $\text{X} = \text{Y} = \text{Z} = \text{NH}_2$   
 (C)  $\text{X} = \text{Y} = \text{Z} = \text{COOH}$   
 (D) None of the above

88. Which does not have a carboxyl group –  
 (A) Benzoic acid (B) Ethanoic acid  
 (C) Picric acid (D) Aspirin
89. When the degree of dissociation of benzoic acid, salicylic acid and 2,6-dihydroxybenzoic acid are compared, it will be found that the degree of dissociation of –  
 (A) Benzoic acid is the highest  
 (B) Salicylic acid is the highest  
 (C) 2,6-dihydroxybenzoic acid is the highest  
 (D) 2,6-Dihydroxybenzoic acid is roughly equal to that of benzoic acid
90. Which among the following represents an amide –
- (A)  (B) 
- (C)  (D) 
91. Dry distillation of the mixture of calcium acetate and calcium benzoate gives –  
 (A) Acetophenone (B) Acetaldehyde  
 (C) Benzaldehyde (D) Benzophenone
92.   $\xrightarrow[\text{(ii) H}^+/\text{H}_2\text{O}]{\text{(i) KMnO}_4/\text{OH}^-}$  X, Predict X in the above reaction –
- (A)  (B) 
- (C)  (D) 
93. In  $\text{C}_6\text{H}_5\text{COOCH}_3 \xrightarrow{\text{LiAlH}_4, \text{H}_2\text{O}/\text{H}^+}$  X, X will be –  
 (A)  $\text{C}_6\text{H}_5\text{COOH} + \text{CH}_3\text{OH}$   
 (B)  $\text{C}_6\text{H}_5\text{CH}_2\text{OH} + \text{CH}_3\text{OH}$   
 (C)  $\text{C}_6\text{H}_5\text{CHO} + \text{CH}_3\text{COOH}$   
 (D) All of the above
94. Benzophenone reacts with acetophenone in the presence of Al (t-butoxide) to give –  
 (A) Benzal acetone  
 (B) Benzal acetophenone  
 (C) Dyprone (D) Ethyl cinnamate
95. Formation of aspirin is possible when acetyl chloride reacts with the following compounds –  
 (A) Benzoic acid (B) Phenol  
 (C) p-Hydroxybenzoic acid  
 (D) o-Hydroxy benzoic acid
96. Which of the following has the maximum acid strength ?  
 (A) o-Nitrobenzoic acid  
 (B) m-Nitrobenzoic acid  
 (C) p-Nitrobenzoic acid  
 (D) p-Nitrophenol
97. Sulphonation of benzoic acid produces mainly  
 (A) o-Sulphobenzoic acid  
 (B) m-Sulphobenzoic acid  
 (C) p-Sulphobenzoic acid  
 (D) o-, p-Disulphobenzoic acid
98. Which of the following statements is correct about benzoic acid ?  
 (A) Benzoic acid is a liquid compound  
 (B) Benzoic acid is a stronger acid than acetic acid  
 (C) Benzoic acid is soluble in cold water  
 (D) Benzoic acid is non-aromatic in nature
99. The  $\text{pK}_a$  of acetyl salicylic acid (aspirin) is 3.5. The pH of gastric juices in human stomach is about 2–3 and the pH in intestine is about 8. Aspirin will be –  
 (A) Unionised in the small intestine and in the stomach  
 (B) Completely ionised in the stomach and almost unionised in the small intestine  
 (C) Ionised in the stomach and almost unionised in the small intestine  
 (D) Ionised in the small intestine and almost unionised in the stomach
100. What would be the final product of the following sequence of reactions ?  
 $\text{C}_6\text{H}_5\text{ONa} \xrightarrow[130^\circ\text{C}]{\text{CO}_2} ? \xrightarrow{\text{H}^+} ? \xrightarrow[\text{H}_2\text{SO}_4]{(\text{CH}_3\text{CO})_2\text{O}}$   
 (A) Salicylic acid (B) Aspirin  
 (C) Methyl salicylate (D) Salol

## ANSWER KEY

### TOPIC WISE MCQS

### Aldehyde & Ketone

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ans.	A	C	C	C	B	A	D	C	A	B	C	D	D	D	A	C	D	A	C	A	C	B	C	A	C
Qus.	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44						
Ans.	A	A	C	D	D	C	D	C	C	C	A	A	C	C	B	C	C	A	C						

### Benzaldehyde

Q.No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	A	D	B	C	A	D	B	C	A	C	B	B	B	C	D	A	D	A	A	B
Q.No	21	22	23	24	25															
Ans.	B	D	C	A	B															

### Carboxylic Acid

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ans.	B	A	B	B	C	A	A	C	C	B	D	C	D	B	D	A	A	B	D	A	B	D	C	A	C
Qus.	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Ans.	B	D	D	C	C	D	C	D	B	C	A	C	B	D	B	C	B	D	C	B	C	C	C	D	B

### Carboxylic Acid Derivatives

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ans.	C	D	B	D	B	C	A	B	A	C	A	C	C	A	D	B	A	A	D	A	D	C	A	A	B
Qus.	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Ans.	C	B	C	A	B	C	B	C	A	A	D	A	B	D	B	B	D	A	A	C	C	C	C	D	B
Qus.	51	52	53	54	55																				
Ans.	C	D	D	C	D																				

### Benzoic Acid

Q.No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	D	C	B	B	A	A	D	A	D	D	B	A	D	B	C	C	A	A	C	A
Q.No	21	22	23	24																
Ans.	B	B	C	B																

## MISCELLANEOUS QUESTIONS

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ans.	C	C	A,B	D	A	D	D	D	C	C	D	A	B	A	C	C	D	C	D	D	C	C	A	C	B
Qus.	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Ans.	B	A	A	B	D	C	D	B	C	A	B	D	C	B	C	D	B	A	B	A	B	A	B	C	D
Qus.	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	C	B	C	A	C	A	B	D	A	D	C	B	D	D	C	C	C	B	B	C	A	D	AB	B	C
Qus.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Ans.	B	D	A	D	B	C	D	D	D	B	D	A	C	A	D	A	C	B	C	D	A	B	B	D	B



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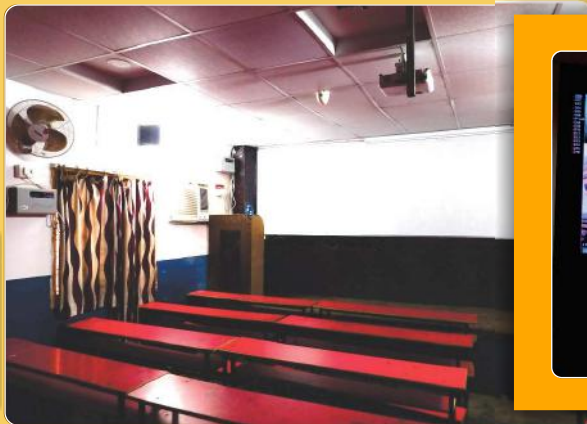
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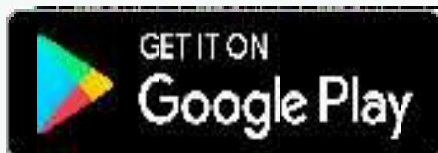


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