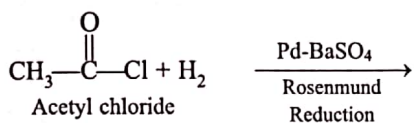


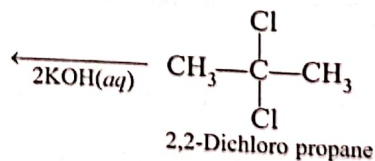
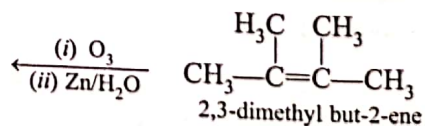
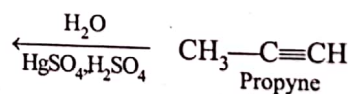
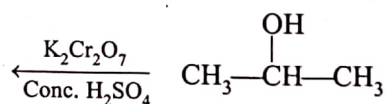
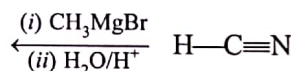
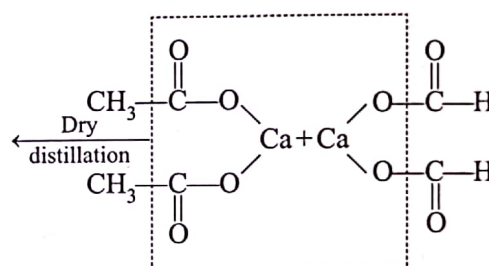
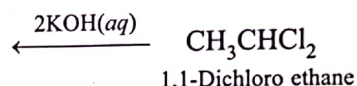
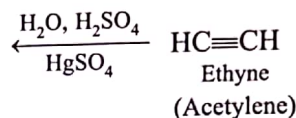
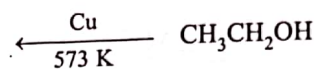
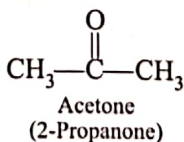
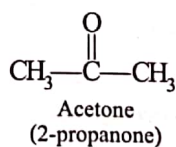
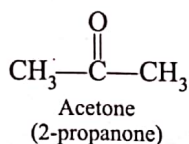
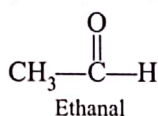
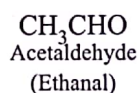
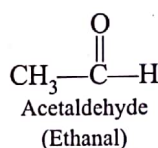
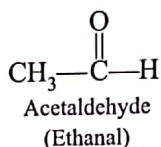
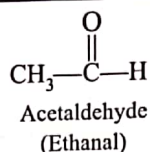
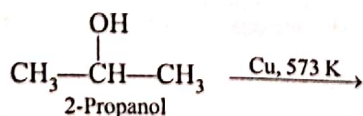
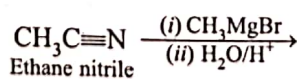
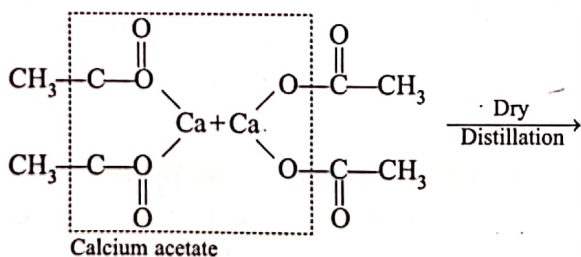
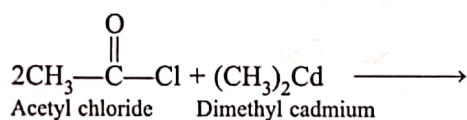
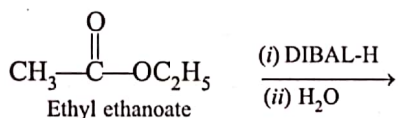
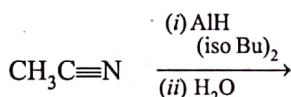
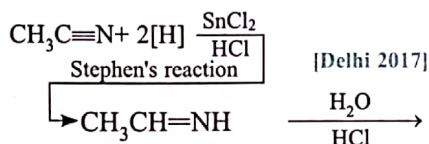
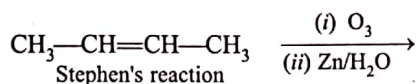
# IMPORTANT REACTIONS AND CONVERSIONS

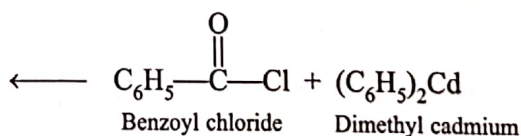
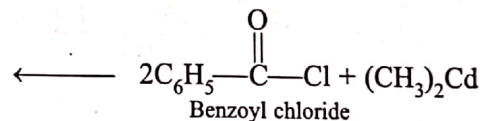
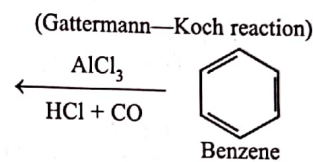
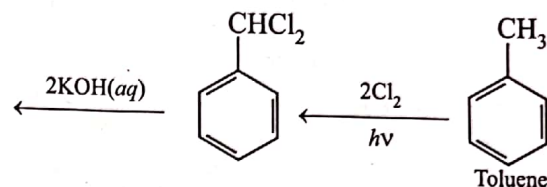
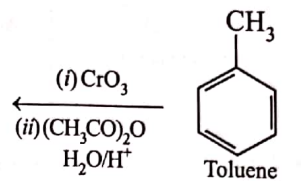
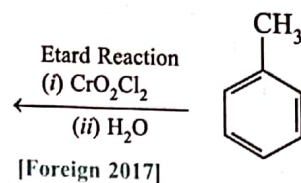
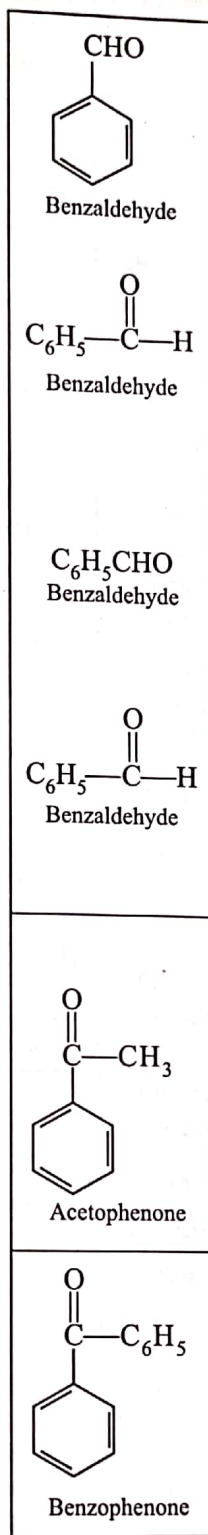
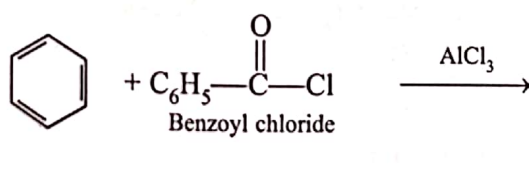
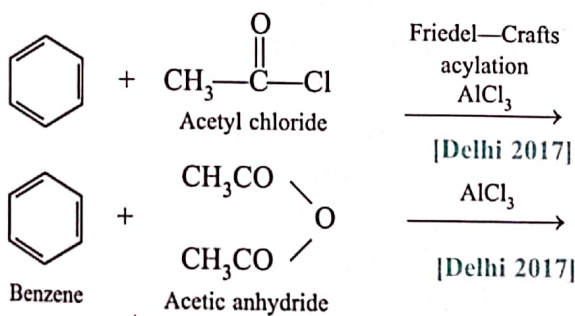
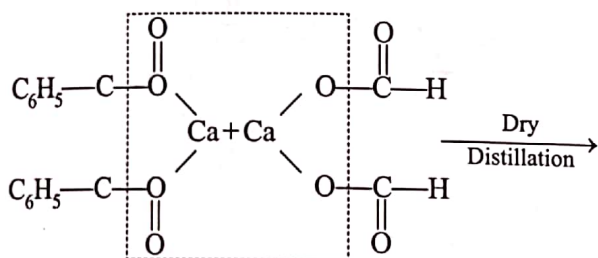
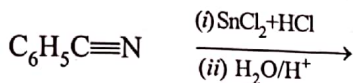
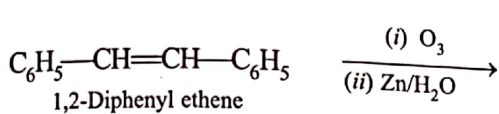
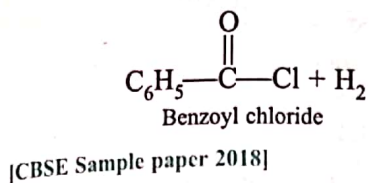
## Aldehydes and Ketones

### Preparations:



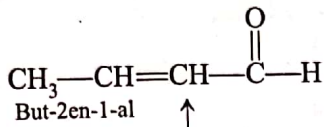
[CBSE Sample Paper 2018; AI 2016]



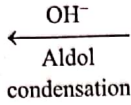
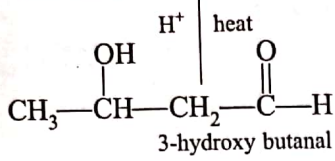


### Physical Properties of Aldehydes and Ketones.

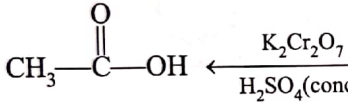
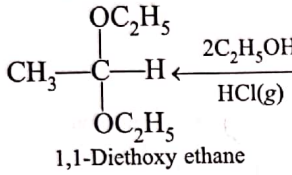
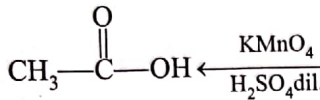
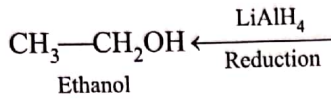
- Aldehydes and ketones are polar in nature. Therefore, their boiling points are higher than that of non-polar compounds but lower than that of alcohols and carboxylic acids.
- The lower members of aldehydes and ketones are soluble in water but higher members do not dissolve in water.
- Formaldehyde is a gas at room temperature while acetaldehyde boils at 294 K. The next nine members are liquids and higher members are solids. Ketones are colourless liquids.
- Lower aldehydes have unpleasant odour. The higher members have pleasant smell. Ketones are generally pleasant smelling. Benzaldehyde has a particular smell of bitter almonds.
- Acetone and other lower ketones are very good solvents.



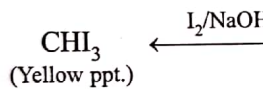
[Delhi 2017]



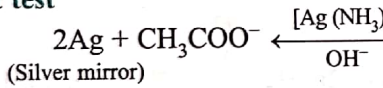
[Delhi 2017]



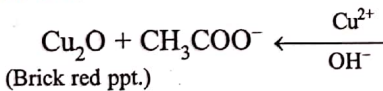
Iodoform test



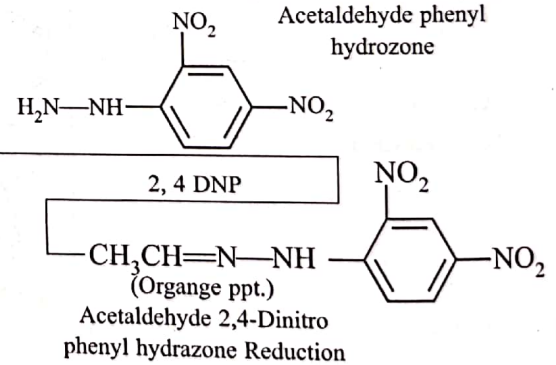
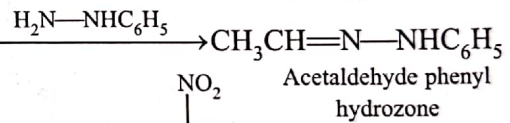
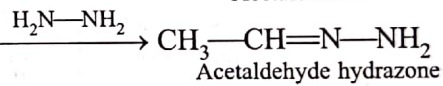
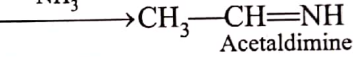
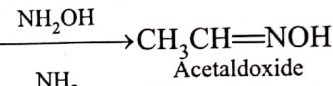
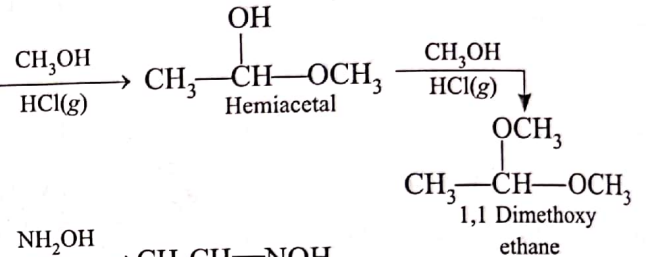
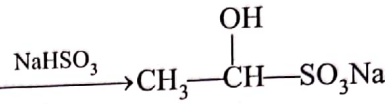
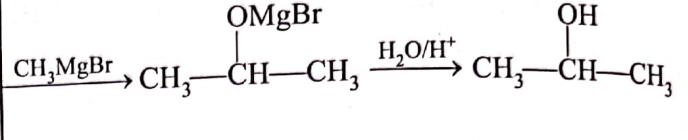
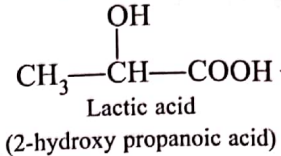
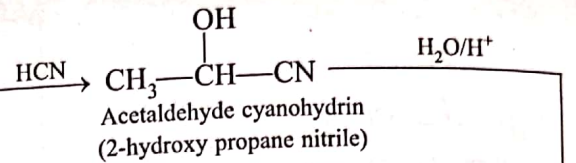
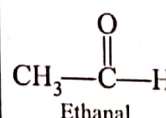
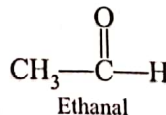
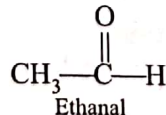
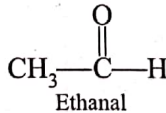
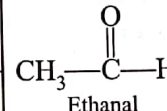
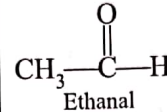
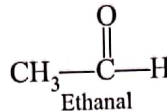
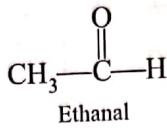
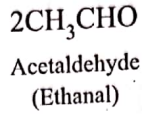
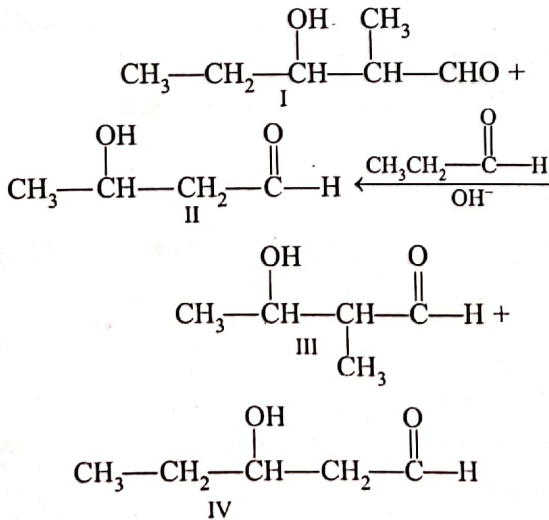
Tollens' reagent test



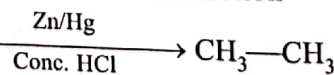
Fehling's solution test



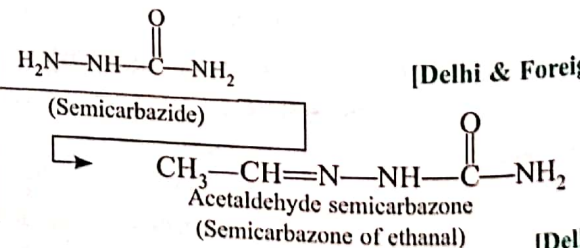
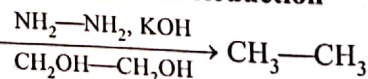
Cross aldol condensation



Clemmensen Reduction



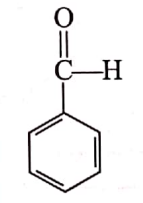
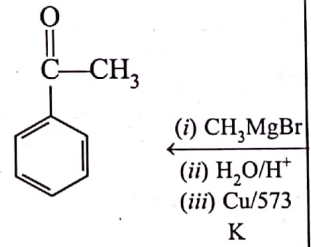
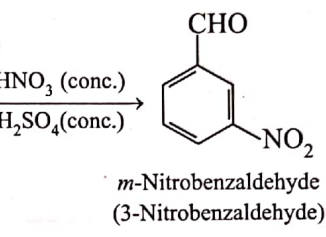
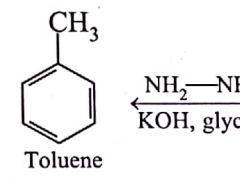
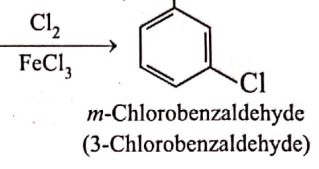
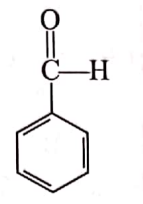
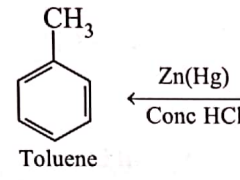
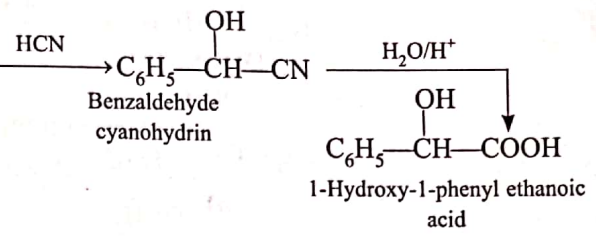
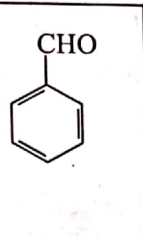
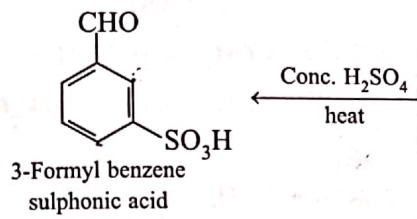
Wolff-Kishner Reduction



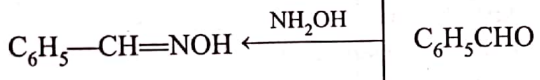
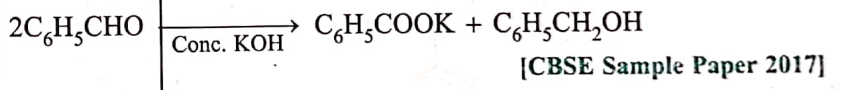
[Delhi & Foreign 2017]

[Delhi 2016]

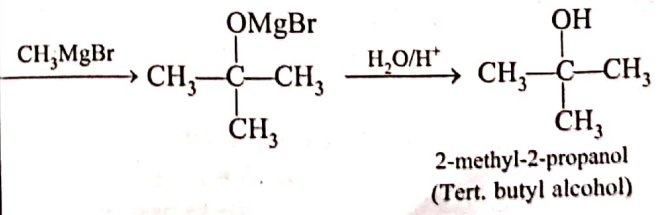
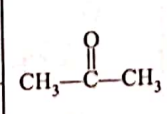
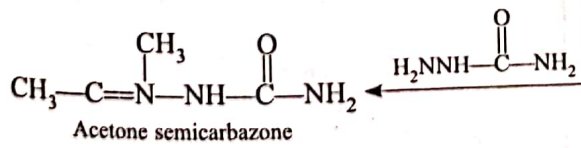
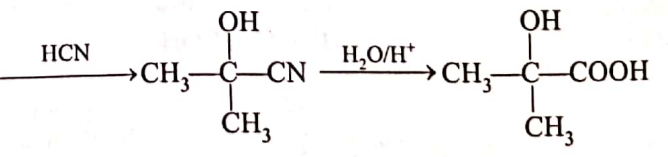
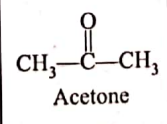
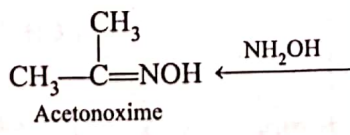
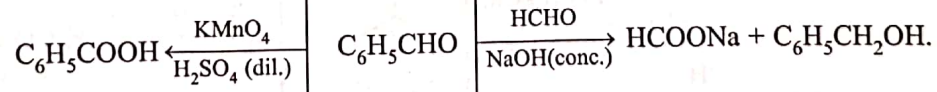


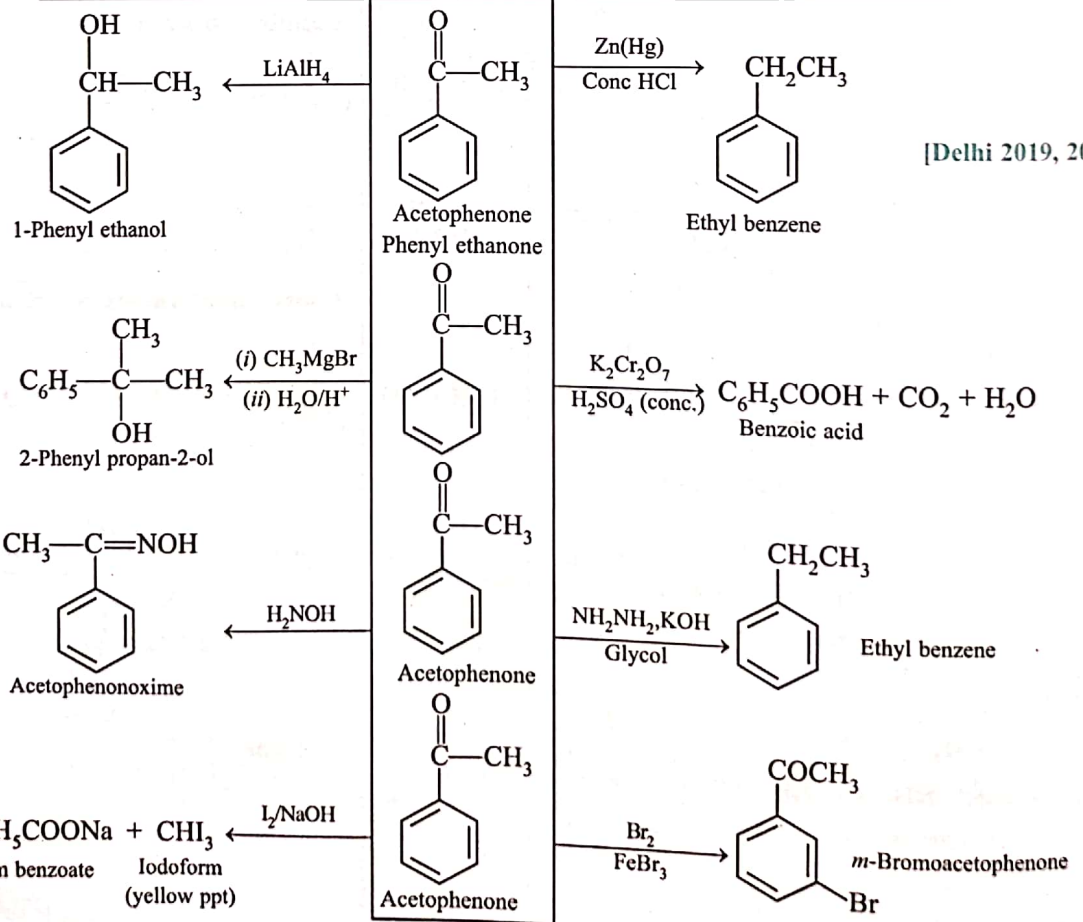
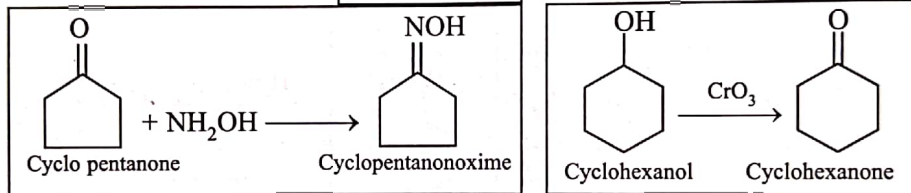
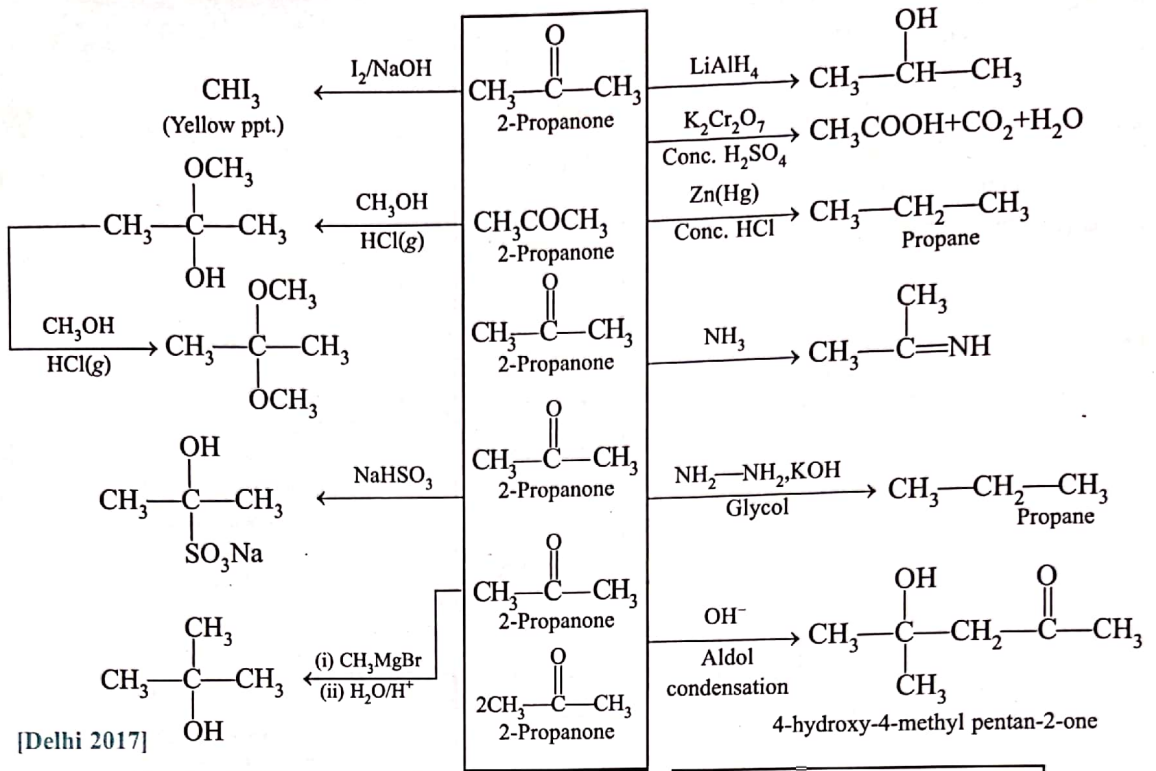


**Cannizzaro's reaction**

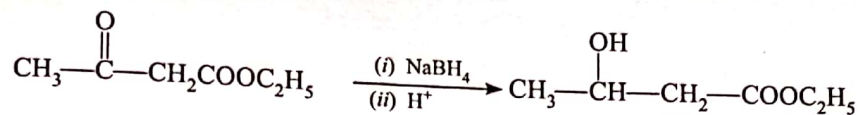


**Cross Cannizzaro's reaction**

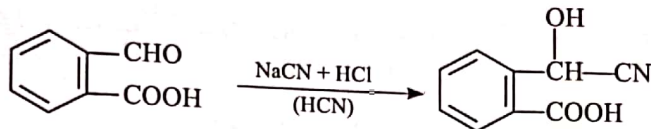




[Delhi 2016]

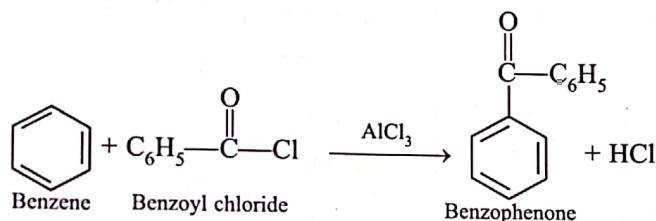
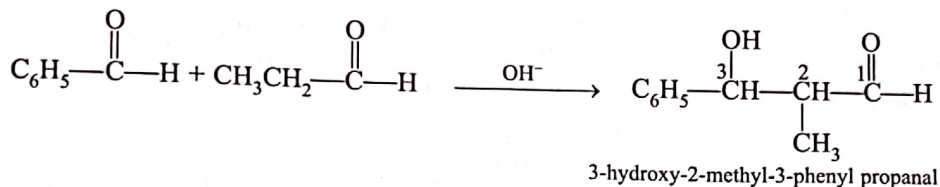


[Chennai 2019]

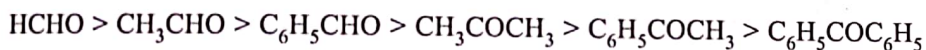


[Similar to Delhi 2019]

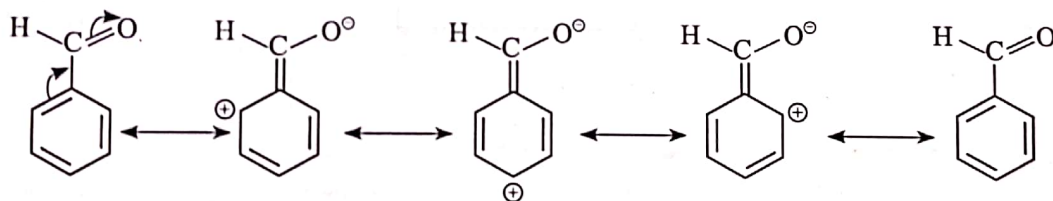
### Claisen condensation



Reactivity towards Nucleophilic addition reactions (steric hindrance increases, reactivity decreases)



[AI 2016]



Electrophilic substitution reactions will take place at *m*-position. There is positive charge on *o*- and *p*-positions, therefore, electron density is maximum at *m*-position.

$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH} > \text{CH}_3\text{CH}_2\text{CH}_2\text{CHO} > \text{C}_2\text{H}_5\text{OC}_2\text{H}_5 > \text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$  is decreasing order of boiling point.

- 2, 2, 6-Trimethyl cyclohexanone does not form cyanohydrin in good yield due to steric hindrance (crowding).

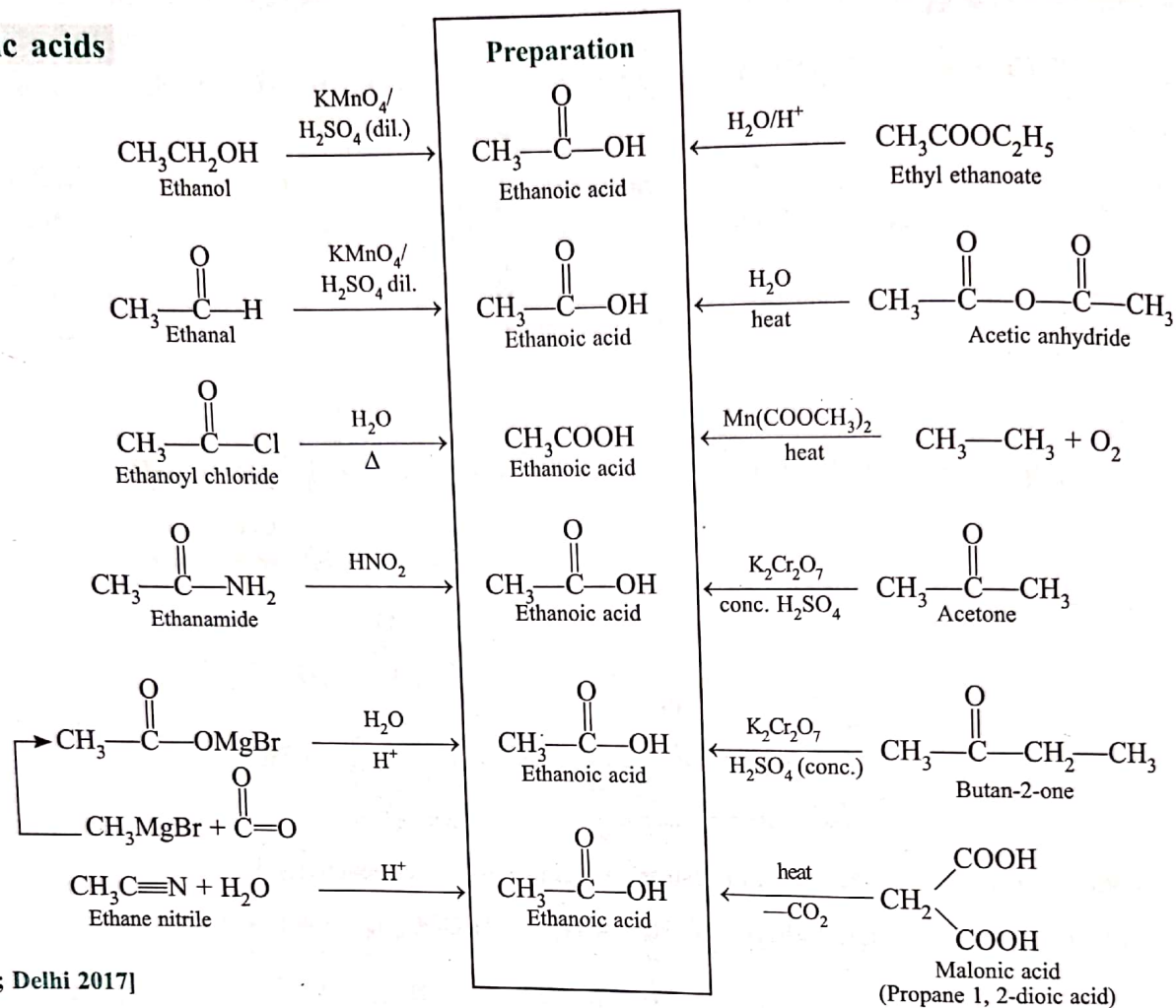
- In  $\text{H}_2\text{N}-\text{NH}-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}_2$ , second  $-\text{NH}_2$  group is attached to  $-\overset{\text{O}}{\parallel}{\text{C}}-$  has double bond character, therefore, it is not involved in reaction with  $\text{>C=O}$  group to form semicarbazone.
- In preparation of ammonia derivatives, pH should be carefully controlled. In strongly acidic medium, ammonia derivatives will get protonated. In strongly basic medium,  $\text{OH}^-$  will be nucleophile and attack  $\text{>C=O}$  group instead of ammonia derivatives.

### Uses of Aldehydes and Ketones.

- 40% aqueous solution of formaldehyde is called *formalin* which is used in preserving zoological specimens.
- Urea formaldehyde resin and phenol formaldehyde resin (Bakelite) are thermosetting polymers.
- Acetaldehyde is used for manufacture of acetic acid, ethyl acetate, vinyl acetate, polymers and drugs.



## Carboxylic acids



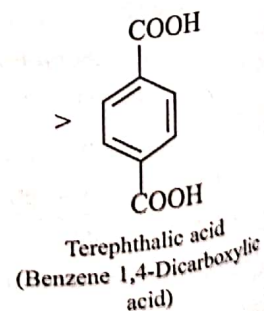
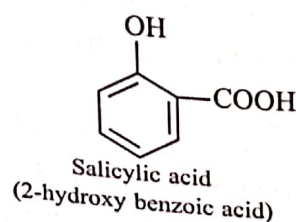
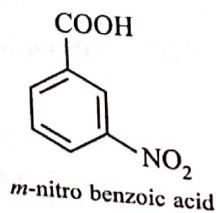
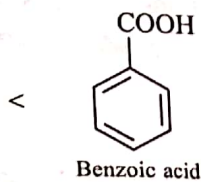
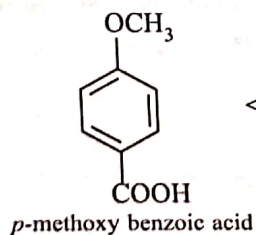
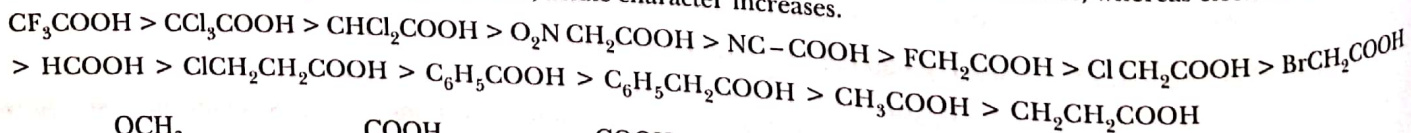
[AI 2016; Delhi 2017]

### Physical Properties of Carboxylic Acids.

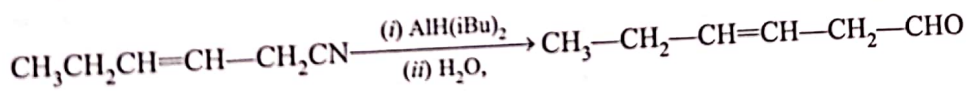
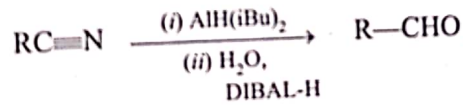
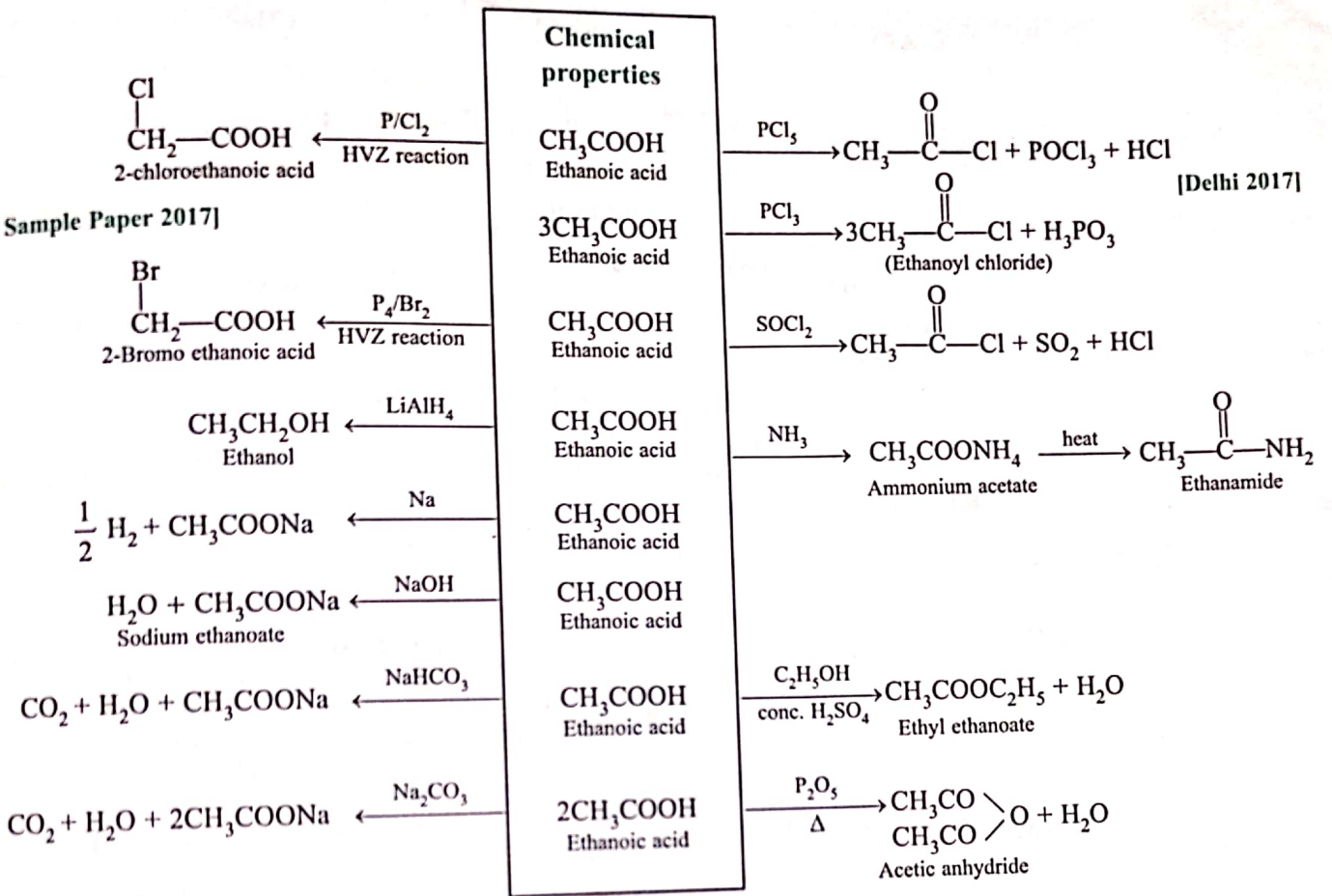
1. Carboxylic acids are polar in nature and can form hydrogen bonds and exist as dimers.
2. Lower members are soluble in water but higher members are insoluble. Aromatic acids like benzoic acid is nearly insoluble in water. Carboxylic acids are soluble in ether, alcohol and benzene.
3. Carboxylic acids have higher boiling points than alcohols. They form dimers due to hydrogen bonding.
4. Their acidity decreases with increase in molecular weight.
5. Melting point of even ones are higher than odd ones i.e. hexanoic acid has higher melting point than heptanoic acid.

### Acidic character

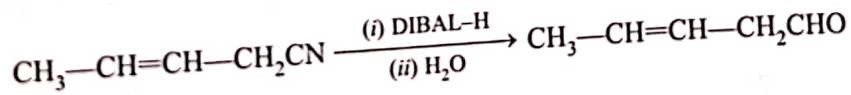
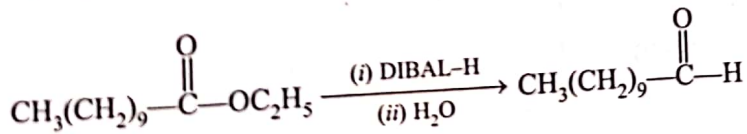
Electron releasing group will destabilise carboxylate ions, therefore, acidic character decreases, whereas electron withdrawing group will stabilise carboxylate ions, therefore, acidic character increases.



[CBSE Sample Paper 2017]



[AI 2016]



[Delhi 2016]