

B.Sc. II Paper-II (Organic Chemistry)

Lecture-1

Aldehydes and Ketones

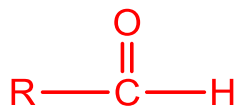
By

Dr A. K. Yadav

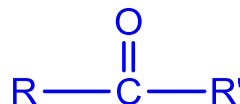
Assistant Professor-Chemistry

Maharana Pratap Government P. G. College, Hardoi, (U.P.)

Carbonyl compounds having the general structures



(I)
Aldehydes

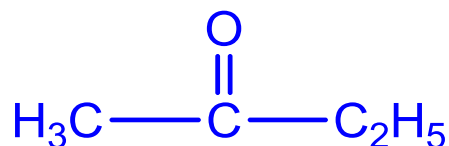
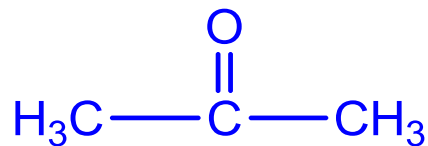


(II)
Ketones

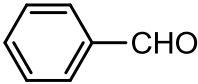
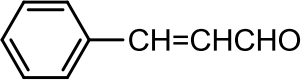
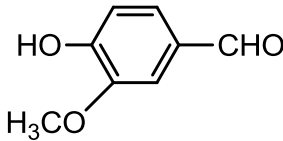
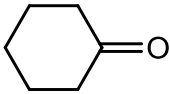
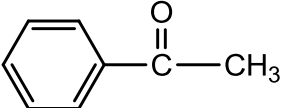
(R and R' may be alkyl or aryl group)

General formula is $\text{C}_n\text{H}_{2n}\text{O}$

In Ketones, when two groups are same are known as **Simple ketones** and when two groups are not same known as **Mixed ketones** eg.



Nomenclature

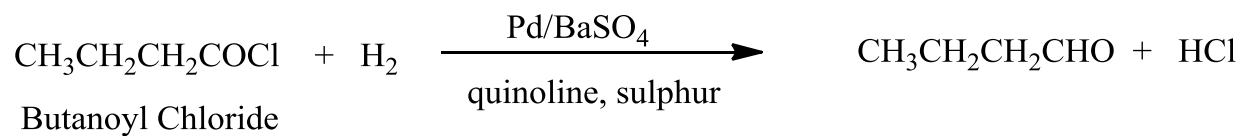
Formula	Common Name	IUPAC Name
HCHO	Formaldehyde	Methanal
CH ₃ CHO	Acetaldehyde	Ethanal
C ₂ H ₅ CHO	Propionaldehyde	Propanal
	Benzaldehyde	Benzaldehyde
	Cinnamaldehyde	3-Phenyl-2-propenal
	Vanillin (odour of vanilla)	4-Hydroxy-3-methoxy-benzaldehyde
CH ₃ COCH ₃	Acetone	Propanone
CH ₃ COC ₂ H ₅	Ethyl methyl ketone	2-Butanone
	Cyclohexanone	Cyclohexanone
	Acetophenone	Phenylethanone

Synthesis of Aldehydes and Ketones

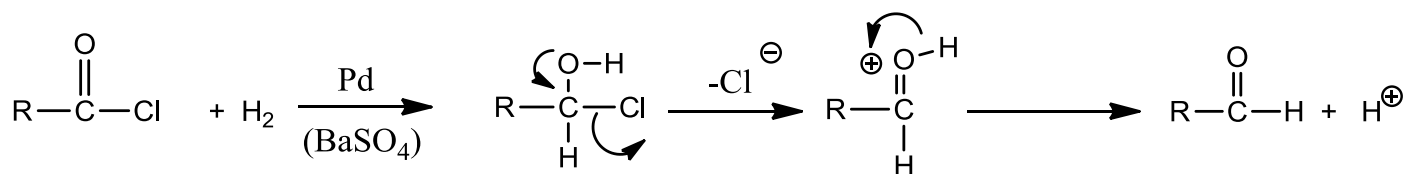
- A. From Acid Chlorides
- B. From 1,3-Dithianes
- C. From Nitriles (Cyanides)
- D. From Carboxylic acids

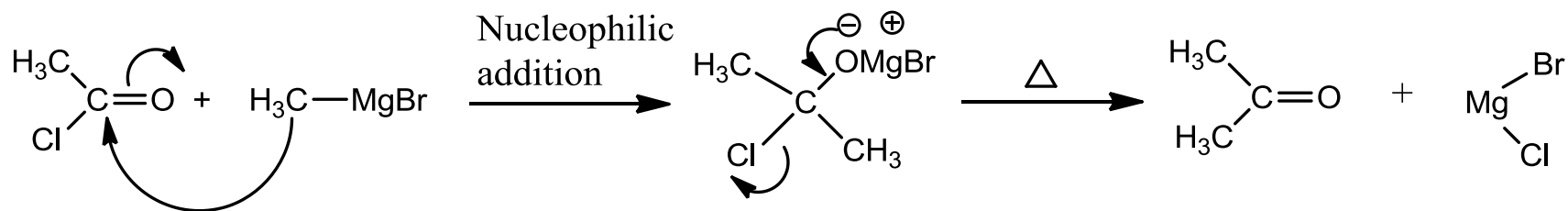
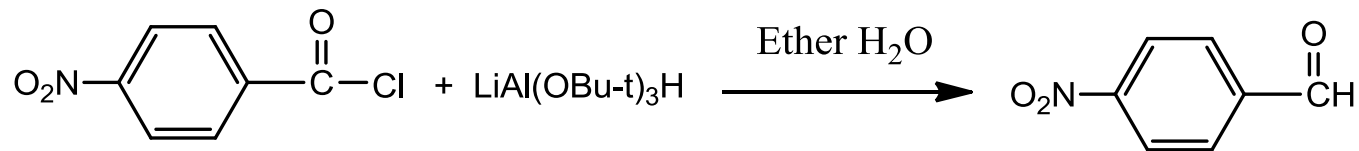
A. From Acid Chlorides

1. Rosenmund reduction:

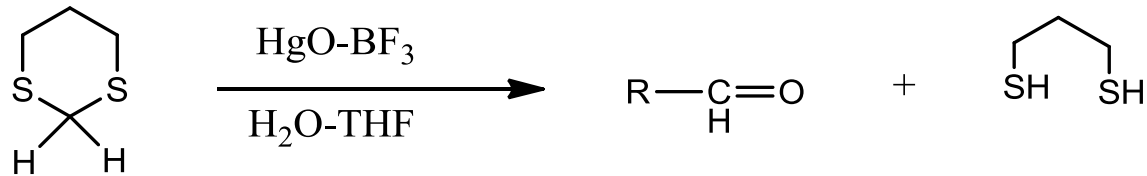


Mechanism:



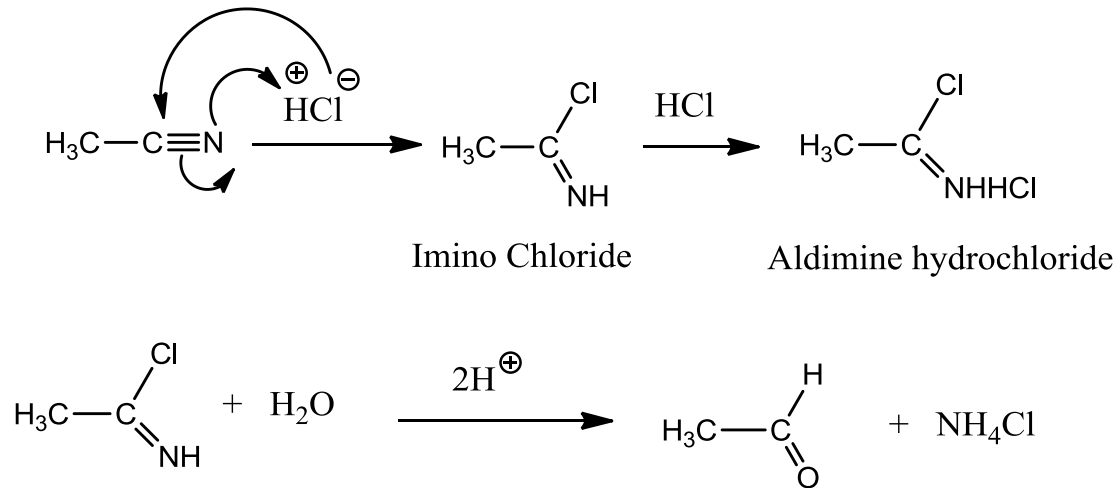


B. From 1,3-Dithianes

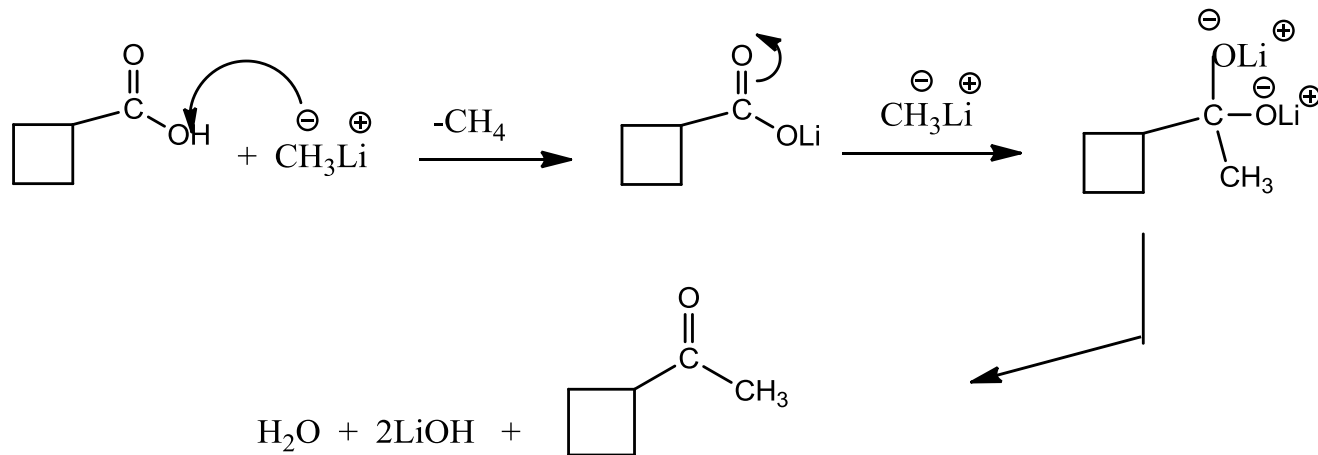


2-Alkyl 1,3-dithiane

C. From Nitriles (Cyanides)



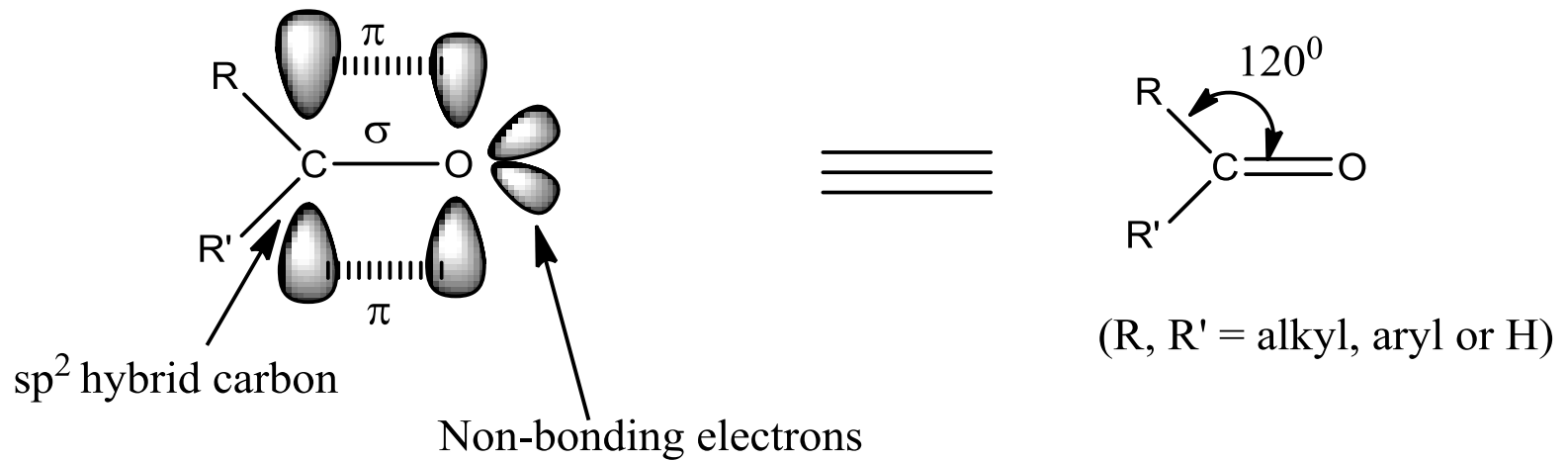
D. From Carboxylic acids



General Physical Properties

- Aldehydes (C_2 to C_{11}) and ketones (C_3 to C_{11}) are colourless, mobile liquids
- Aldehydes and Ketones $> C_{11}$ are solids
- Aldehydes (Unpleasant smell), Higher ones have fruity smell
- ketones (Pleasant smell)
- Solubility rapidly falls with rising M. wt. due to increase hydrophobic chain

Structure of carbonyl groups



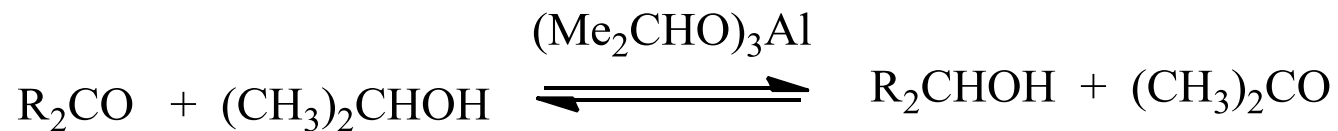
- 1) Reduction Reactions
- 2) Nucleophilic Additions
- 3) Condensation Reactions
- 4) Hydride Transfer Reaction
- 5) Condensation Reactions with ammonia derivatives
- 6) Reaction with Phosphine derivatives
- 7) Oxidation Reactions
- 8) Polymerisation

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Reduction with lithium aluminium hydride or sodium borohydride



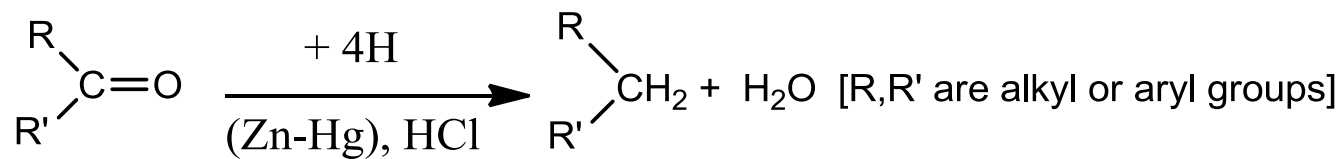
Meerwein Ponderf Verley reduction (Reduction with aluminium isopropoxide)



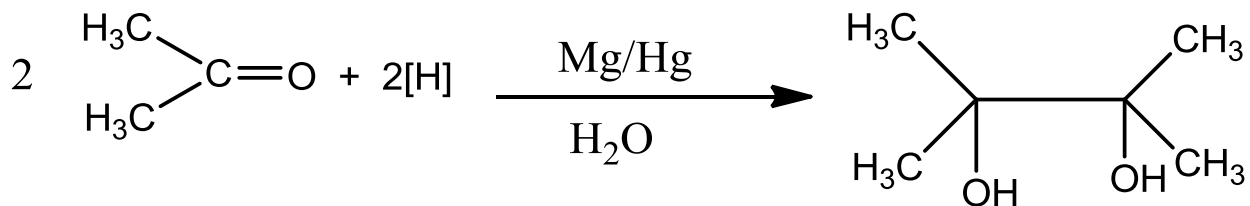
Wolff-Kishner reduction



Clemmensen reduction

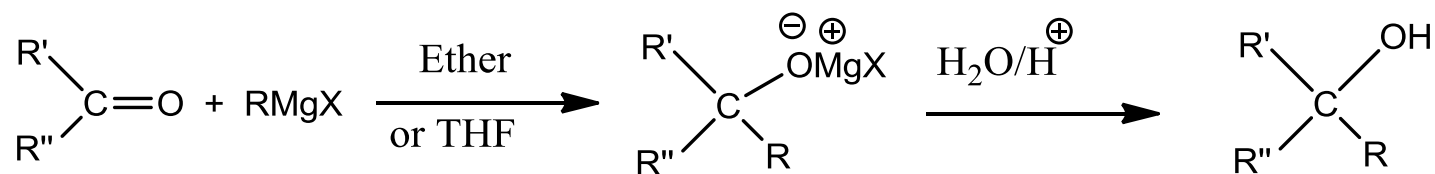


Bimolecular reduction to pinacols

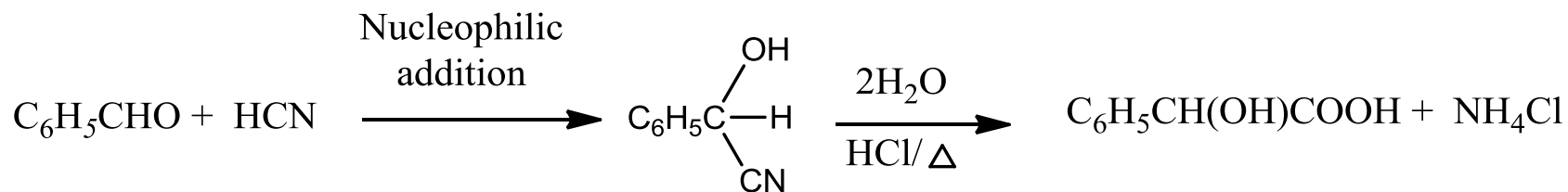


Pinacol

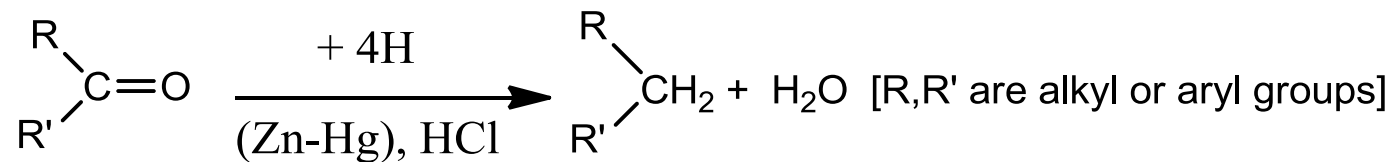
Addition of Grignard reagent (G.R.)



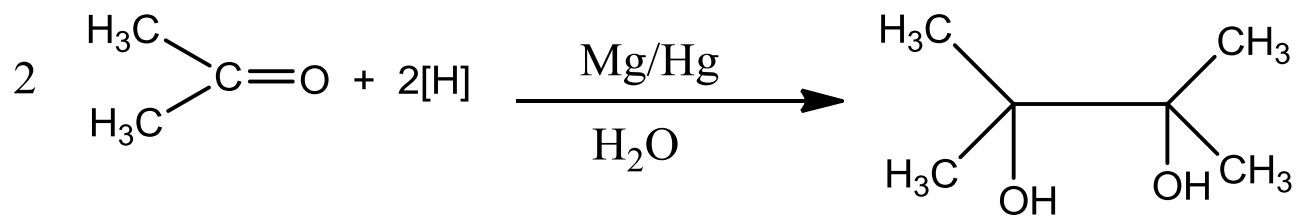
Addition of HCN



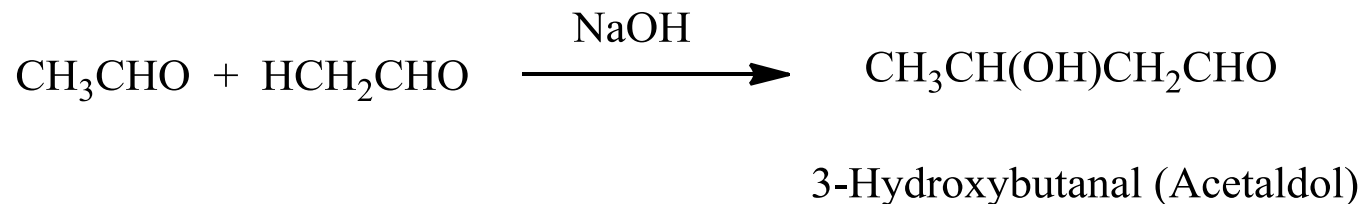
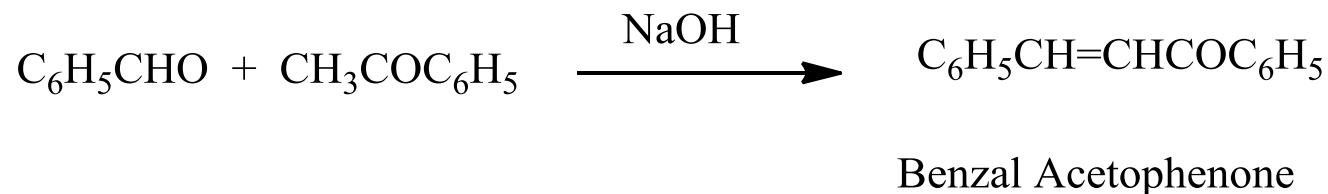
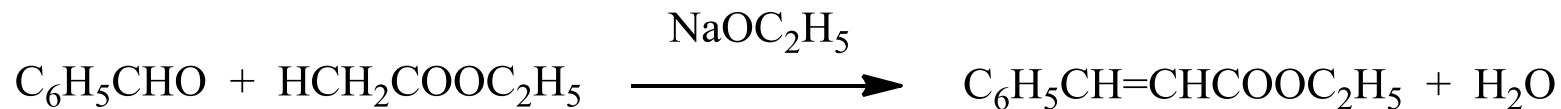
Clemmensen reduction



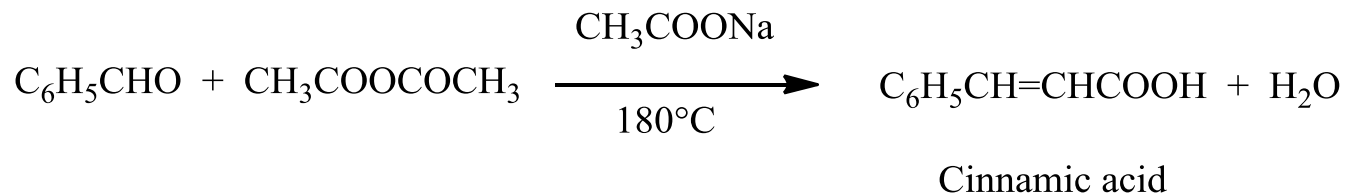
Bimolecular reduction to pinacols



Pinacol

Aldol condensation (self-addition)**Claisen-Schmidt reaction****Claisen Reaction**

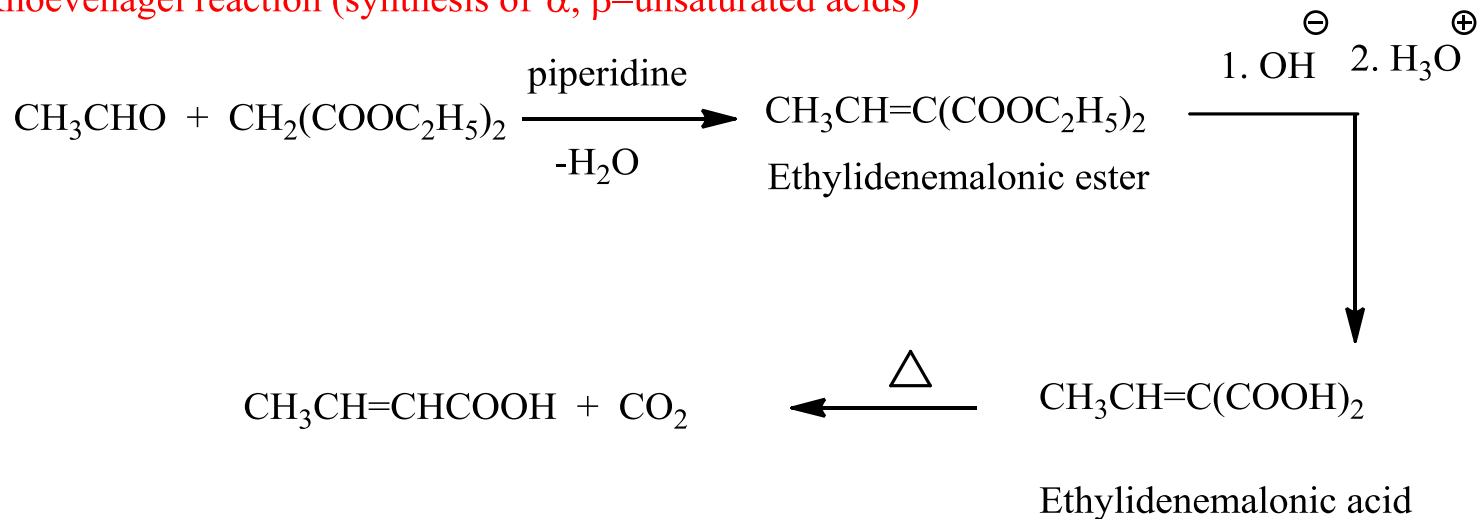
Perkin Reaction



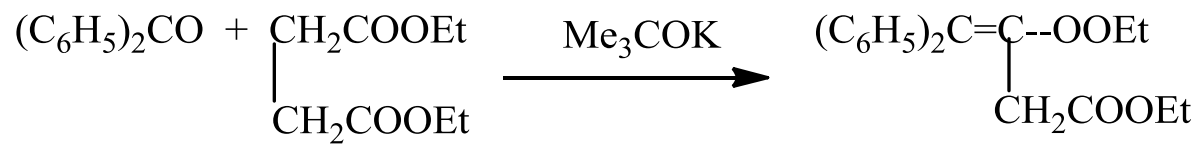
Benzoin Condensation



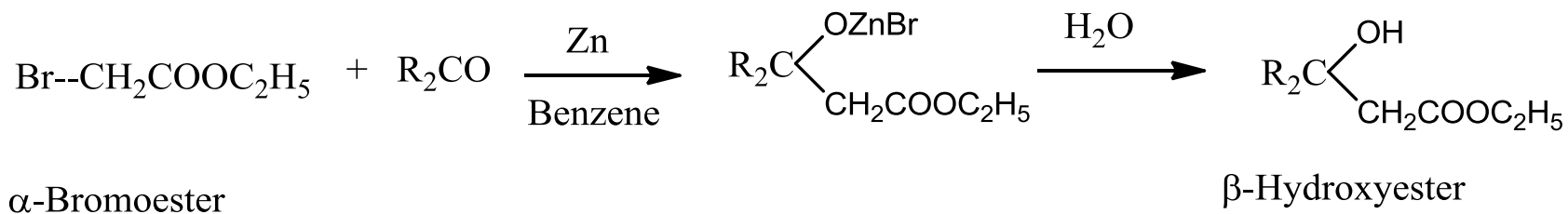
Knoevenagel reaction (synthesis of α, β -unsaturated acids)



Stobbe condensation



Reformatsky reaction



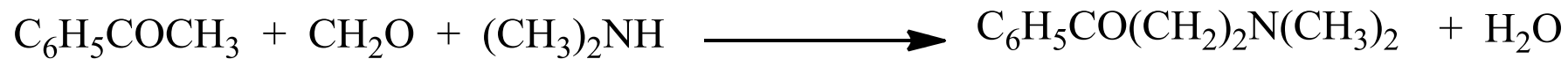
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Cannizzaro reaction



5

Mannich reaction



THANKS