Aldehyde and Ketone

Preparation of Acetaldehyde :-

1. $CH_3CH_2OH \xrightarrow[H_2SO_4]{Na_2Cr_2O_7/} CH_3CHO$
   [O]

2. $CH_2=CH_2 \xrightarrow[O_2,\ H_2O]{PdCl_2, CuCl_2} CH_3CHO$
   (Wacker process)

3. $CH_3-\overset{O}{\overset{\|}{C}}-Cl \xrightarrow[\text{boiling xylene}]{H_2/Pd-BaSO_4} CH_3-\overset{O}{\overset{\|}{C}}-H$
   (Rosenmund reduction)

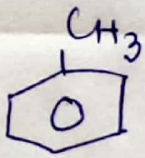
4. $CH_3CH_2OH \xrightarrow[300^\circ C]{Cu/} CH_3-\overset{O}{\overset{\|}{C}}-H$

5. $CH_3-CN \xrightarrow[H_2O]{SnCl_2/HCl} CH_3-\overset{O}{\overset{\|}{C}}-H$
   (Stephen Reduction)

6. $H-C\equiv C-H \xrightarrow[70-80^\circ C]{20\%\ H_2SO_4,\ HgSO_4} CH_3-\overset{O}{\overset{\|}{C}}-H$

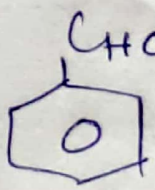
Preparation of Benzaldehyde

1. Etard reaction :-



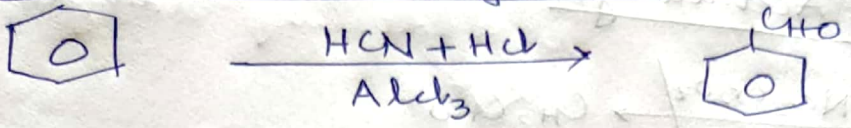
Toluene

$\xrightarrow[H_2O]{CrO_2Cl_2}$



Benzaldehyde

Gattermann Aldehyde Synthesis:-

2. 

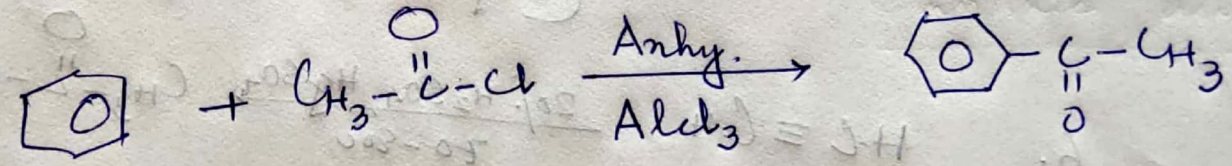
Preparation of Ketone

1. $CH_3-C\equiv N + CH_3MgBr \xrightarrow[H_3O^+]{\text{dry ether}} CH_3-\overset{O}{\overset{\|}{C}}-CH_3$

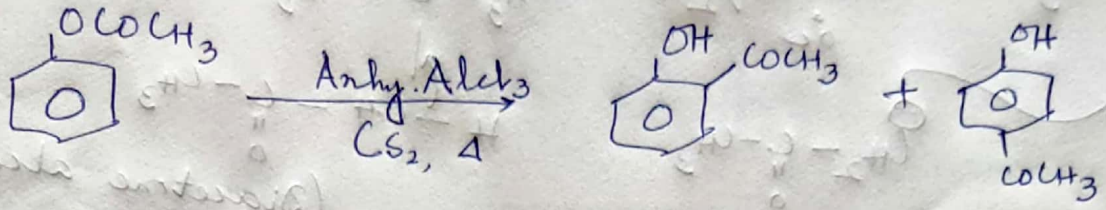
2. $R-\overset{O}{\overset{\|}{C}}-Cl + R'_2Cd \longrightarrow R-\overset{O}{\overset{\|}{C}}-R'$

3. $CH_3-\underset{OH}{\underset{|}{CH}}-CH_3 \xrightarrow[300^\circ C]{Cu} CH_3-\overset{O}{\overset{\|}{C}}-CH_3$

4. $CH_3-C\equiv C-H \xrightarrow[HgSO_4,\ 70\text{-}80^\circ C]{20\%\ H_2SO_4,\ \Delta} CH_3-\overset{O}{\overset{\|}{C}}-CH_3$

5. 

Fries Rearrangement :-



Aldol Condensation :-

Who Responds ? α-H Containing aldehyde or Ketone.

Reagent : 5% NaOH (or, $Ba(OH)_2$)

- Two molecules of aldehyde or Ketone Containing α-H atom Combine with each other to form β-hydroxyaldehyde or, β-hydroxy Ketone.

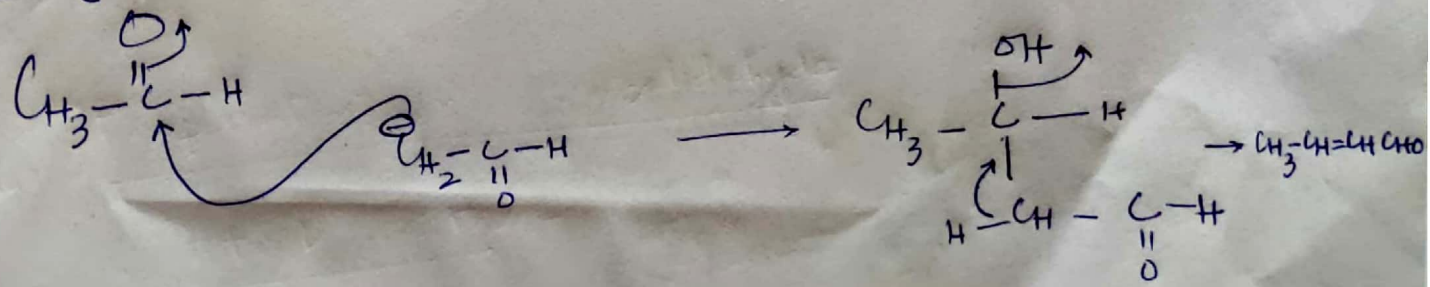
(1.) $2\,CH_3-\overset{O}{\overset{\|}{C}}-H$ (acetaldehyde) $\xrightarrow{\text{dil NaOH}}$ $CH_3-\underset{OH}{CH}-\underset{H}{CH}-CHO$ (3-hydroxybutanal)

$\downarrow \Delta\ (-H_2O)$

$CH_3-CH=CH-CHO$.

Crotonaldehyde

Pathway



2. $CH_3-\overset{O}{\overset{\|}{C}}-CH_3 \xrightarrow[0^\circ C]{Ba(OH)_2}$ $CH_3-\overset{OH}{\overset{|}{C}}-CH_3$

$CH_2-\overset{O}{\overset{\|}{C}}-CH_3$

$CH_3-\underset{OH}{\underset{|}{C}}-CH_2-\overset{O}{\overset{\|}{C}}-CH_3$

(Diacetone alcohol)

$\downarrow -H_2O$ I_2, Δ

$CH_3-\overset{}{\overset{\|}{C}}-CH_3$

$CH-\overset{O}{\overset{\|}{C}}-CH_3$

Mesityl Oxide

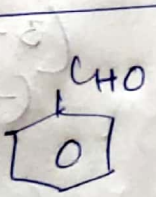
(*) Claisen Schmidth Reaction :-

$C_6H_5CHO + CH_3CHO \xrightarrow{dil\ NaOH} C_6H_5CH=CHCHO$

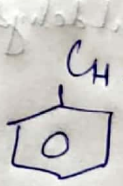
[redacted]

Cinnamaldehyde

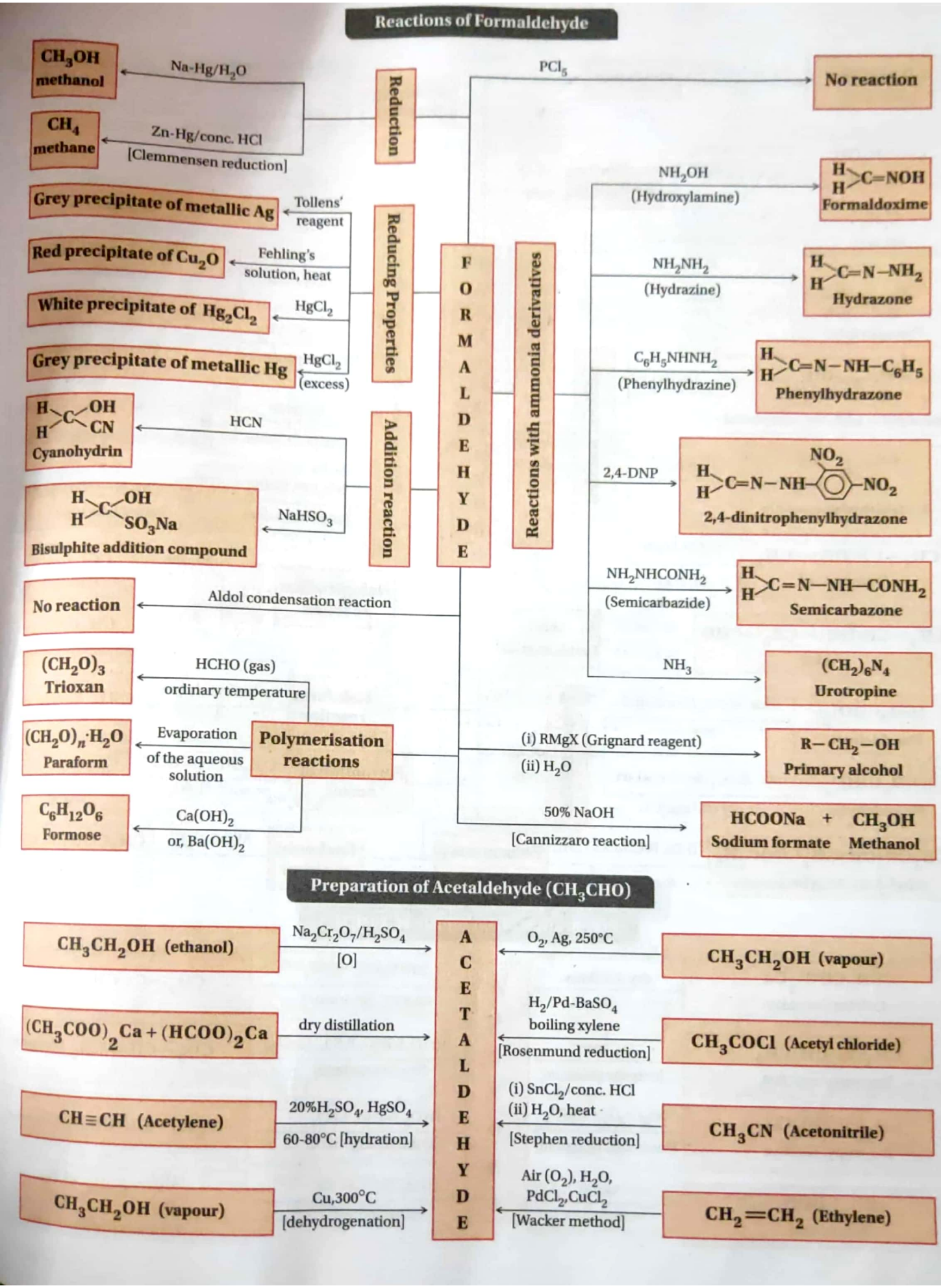
(*) Perkin Condensation



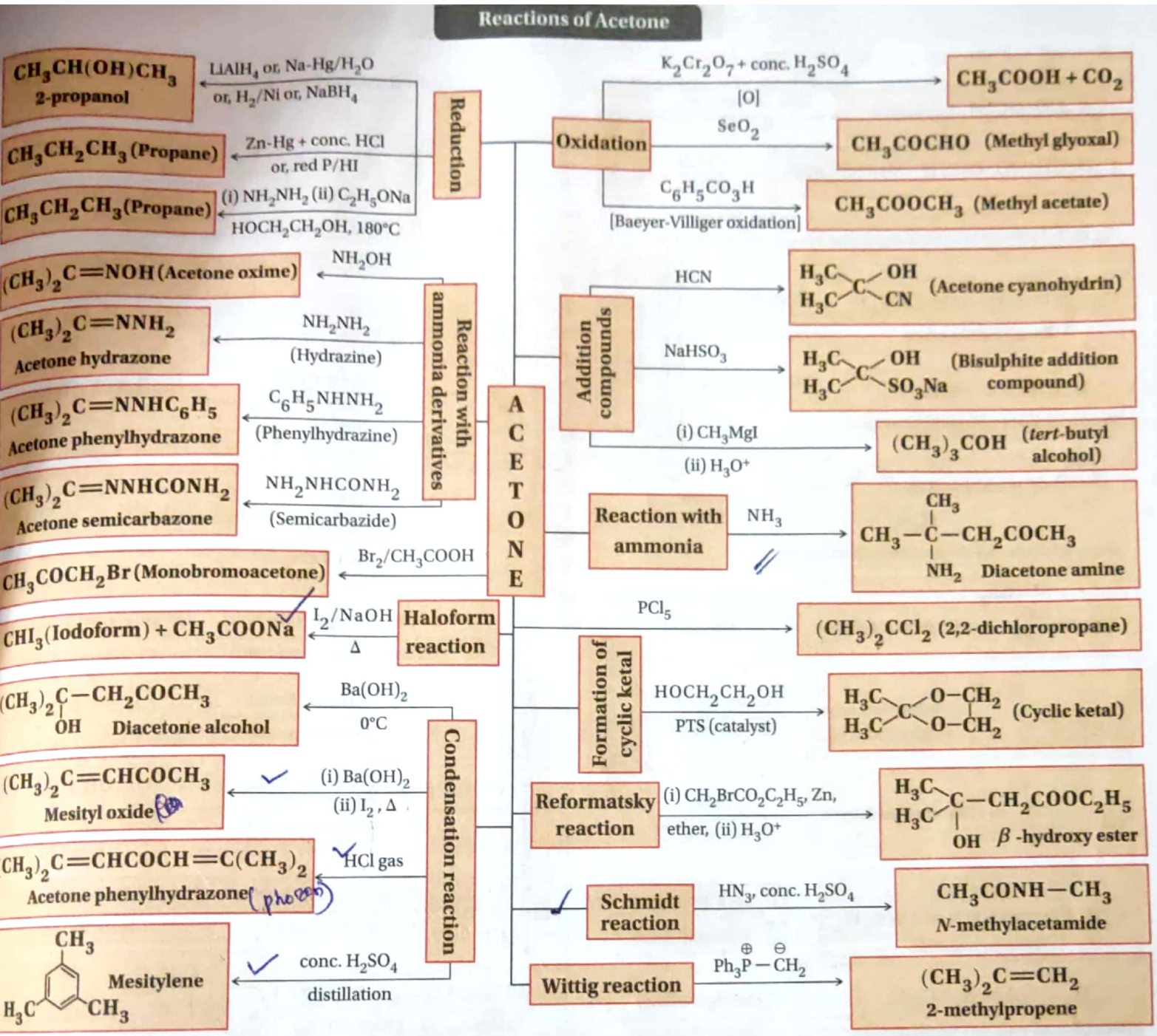
$\xrightarrow[CH_3COONa,\ 140^\circ C]{(CH_3-\overset{O}{\overset{\|}{C}})_2O}$



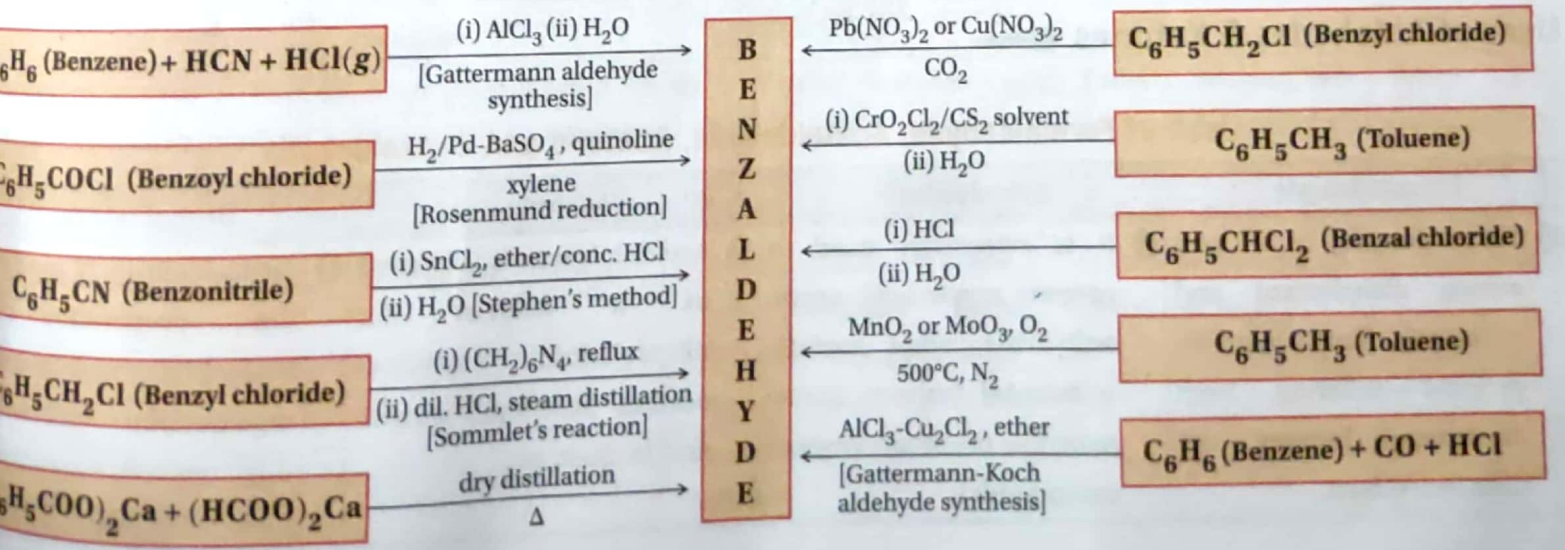
Cinnamic acid



Reactions of Acetone



Preparation of Benzaldehyde (C_6H_5CHO)



Reactions of Benzaldehyde