

ALDEHYDES, KETONES AND CARBOXYLIC ACIDS

CONCEPT MAP

Get well-prepared for exams with quick revision of some important reactions and tests of Aldehydes, Ketones and Carboxylic acids.

Class XII

Aldehydes

General formula : $C_nH_{2n}O$
IUPAC name : Alkanal

Ketones

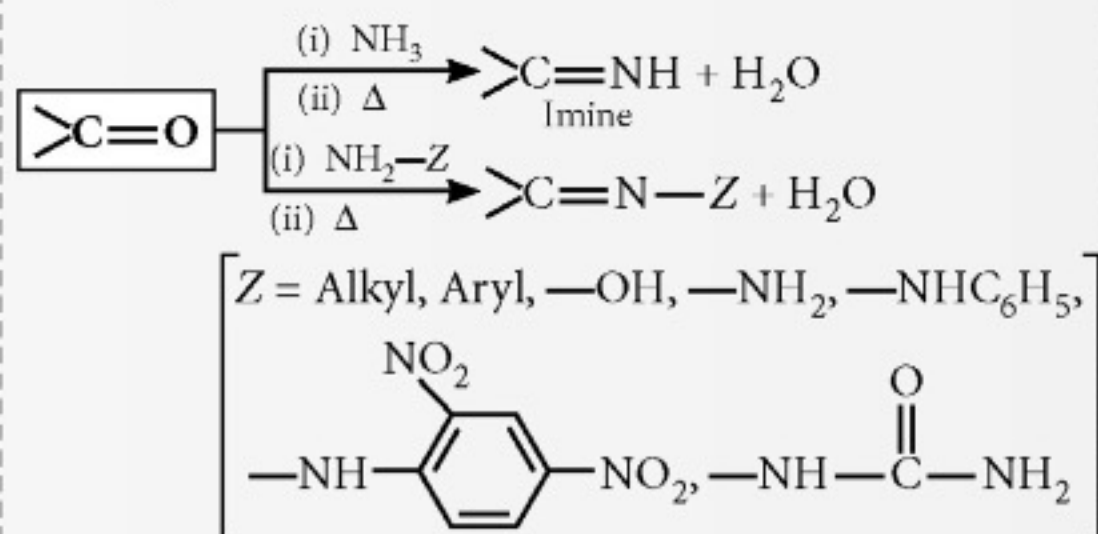
General formula : $C_nH_{2n}O$
IUPAC name : Alkanone

Carboxylic Acids

General formula : $C_nH_{2n}O_2$
IUPAC name : Alkanoic acid

Chemical Properties

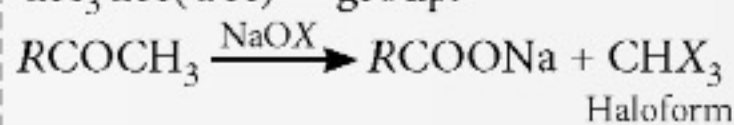
Nucleophilic addition-elimination reactions



- $RCHO \xrightarrow{\text{Reduction}} RCH_2OH$ (H_2/Ni or Pt or Pd , $LiAlH_4$ or $NaBH_4$)
- $RCOR' \xrightarrow{\text{Reduction}} RCH(OH)R'$
- $RCHO \xrightarrow{\text{Reduction}} RCH_3$ ($Zn-Hg/HCl, NH_2NH_2/KOH, HI/Red P$)
- $RCOR' \xrightarrow{\text{Reduction}} RCH_2R'$
- $RCHO \xrightarrow{\text{Oxidation}} RCOOH$ (Even with mild oxidizing agents, same no. of C-atoms)
- $RCOR' \xrightarrow{\text{Oxidation}} RCOOH$ (With strong oxidizing agents, lesser no. of C-atoms)

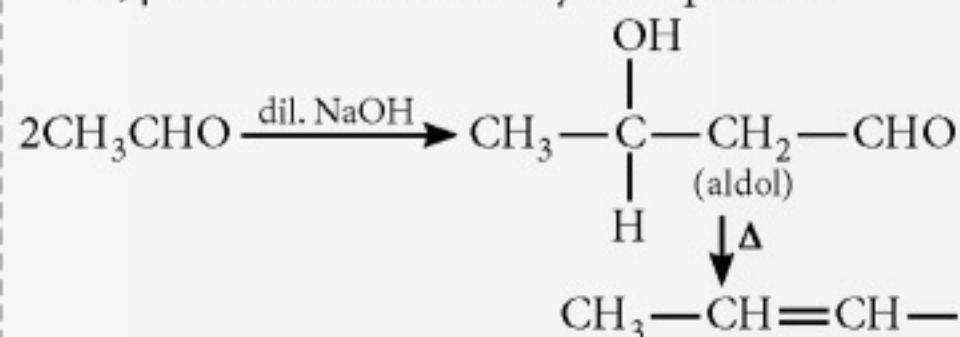
Haloform reaction

Given by compounds having CH_3CO- group or $CH_3CH(OH)-$ group.



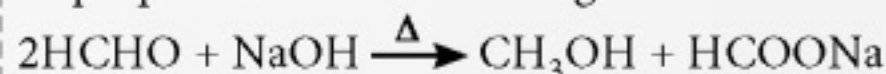
Aldol condensation

- Aldehydes and ketones having at least one α -H atom undergo a reaction in the presence of dilute alkali as a catalyst to form β -hydroxyaldehydes (aldol) or β -hydroxyketones (ketol), respectively.
- The aldol and ketol readily lose water to give α, β -unsaturated carbonyl compounds.

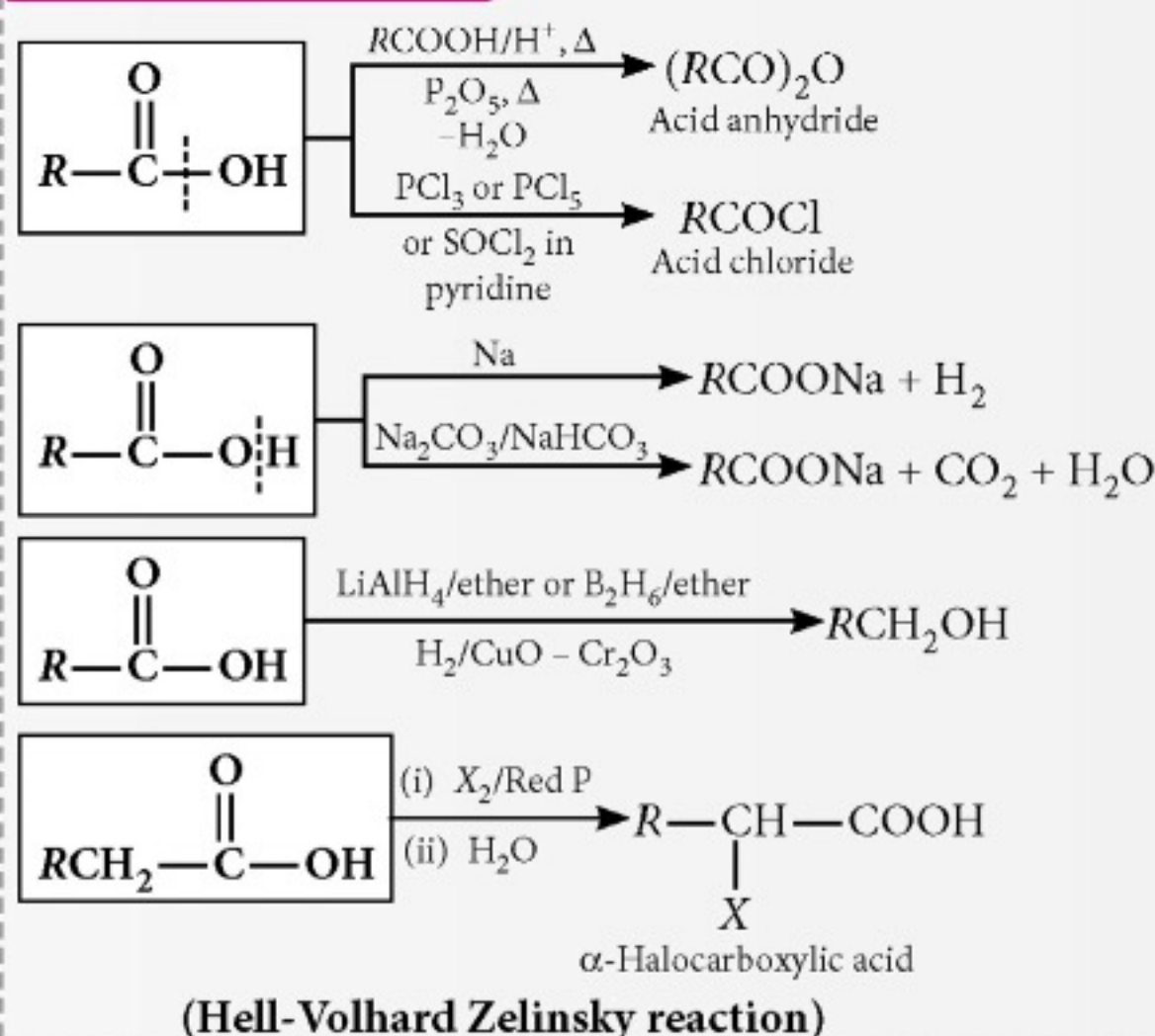


Cannizzaro reaction

Aldehydes which do not have α -H atom undergo disproportionation on heating with concentrated alkali.



Chemical Properties



Test for Carboxylic Group

Test	Inference
$NaHCO_3$	Brisk effervescence of CO_2 gas
$FeCl_3$	Buff coloured ppt.

Distinction Test

Test	Aldehydes	Ketones
Schiff's reagent	Pink colour	No colour
Fehling's solution	Red ppt.	No ppt.
Tollens' reagent	Silver mirror	No ppt.
Sodium hydroxide	Brown resinous mass (formaldehyde does not give this test).	No reaction
Alkaline sodium nitroprusside	A deep red colour (formaldehyde does not respond to this test).	Red colour which changes to orange.