ORGANIC CHEMISTRY- I

IMPORTANT QUESTIONS

UNIT 4

IMPERFECT
PHARMACY

QUESTION - 1

1 DISCUSS THE MECHANISM AND REACTIONS OF :

- ALDOL & CROSSED ALDOL CONDENSATION
- CANNIZARO & CROSSED CANNIZARO
- BENZOIN & PERKIN CONDENSATION

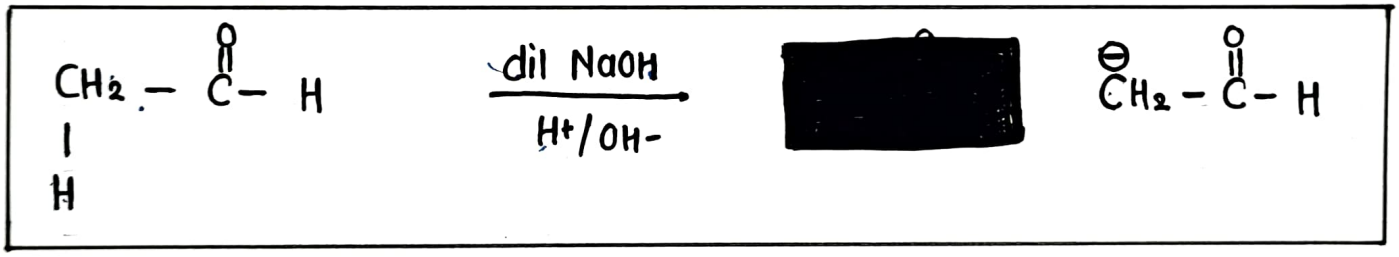
ALDOL CONDENSATION

- Aldehydes or ketones having at least one α - hydrogen undergoes an organic reaction in presence of dilute base (generally dilute NaOH) to form β - hydroxyaldehyde (also known as Aldol) & the reaction is known as **Aldol Reaction**.
- Finally after the formation of Aldol by removing a water molecule a new product form known as Enal & the reaction is known as Aldol Condensation.

Mechanism

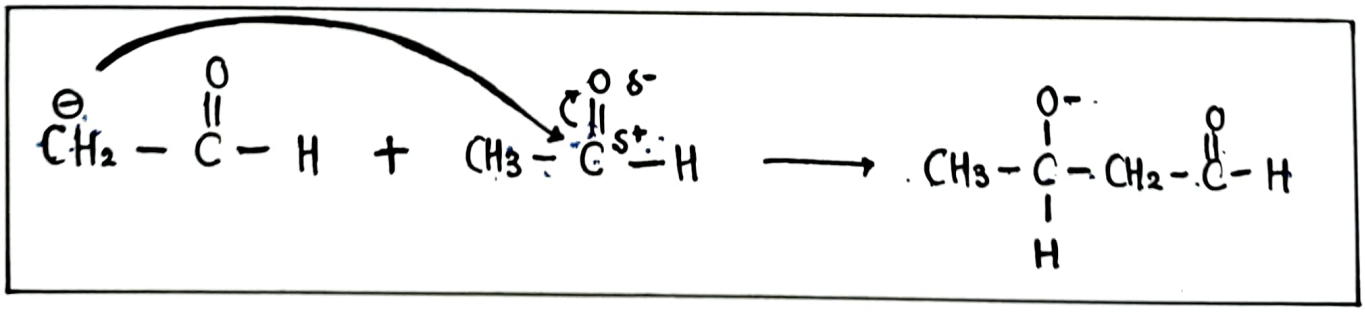
STEP-I

Hydroxide acts as a base & removes the acidic α - hydrogen from aldehyde.



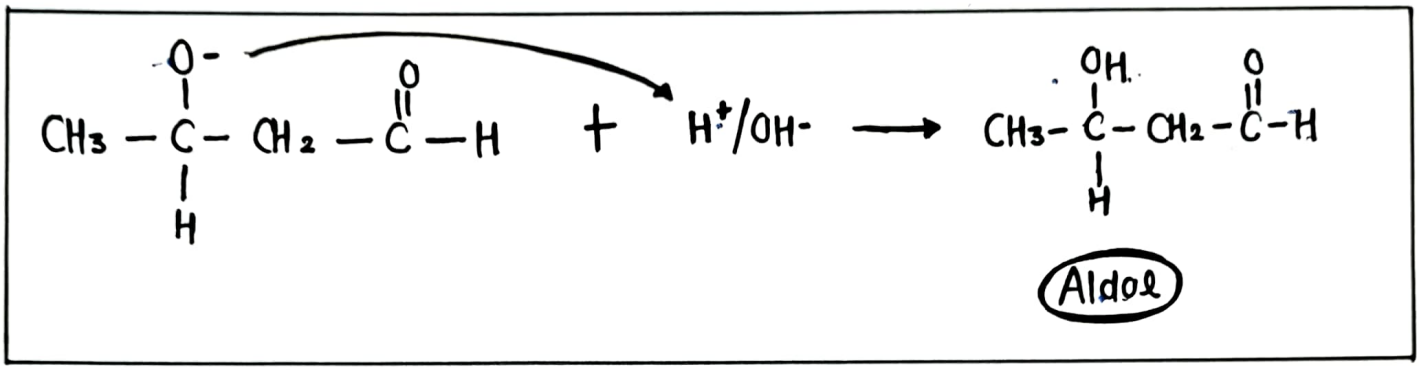
STEP-II

Nucleophile attacks on aldehyde at electrophilic carbon atom.



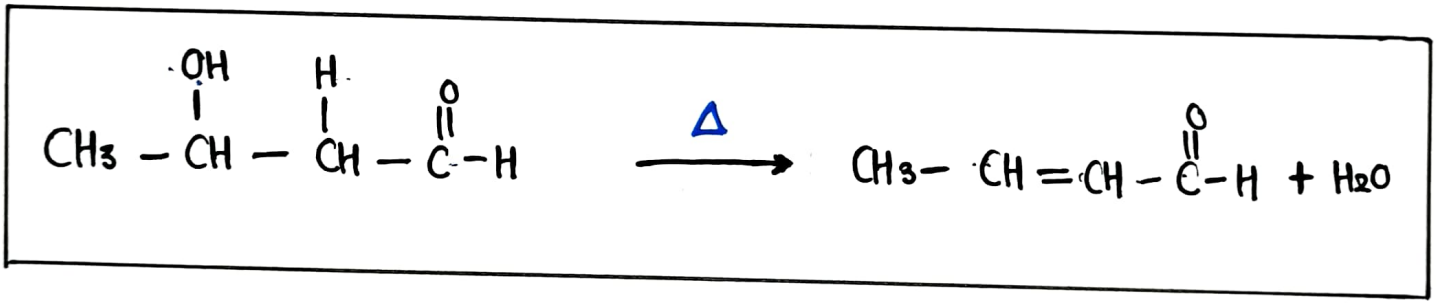
STEP - III

Removal of H^+ from water to form Aldol



FINAL STEP

Removal of water molecule from Aldol compound

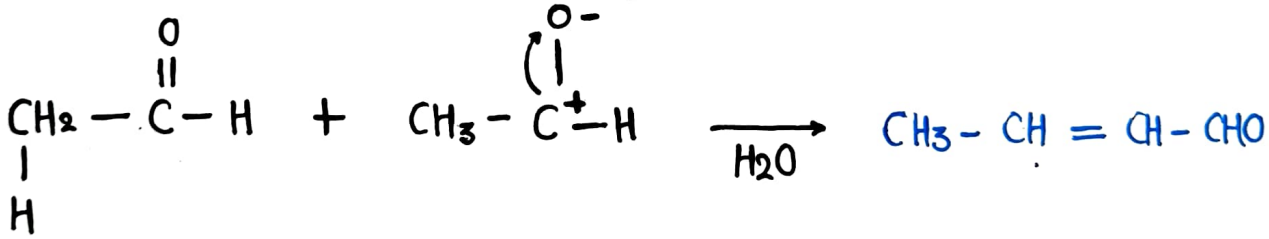


CROSSED ALDOL CONDENSATION

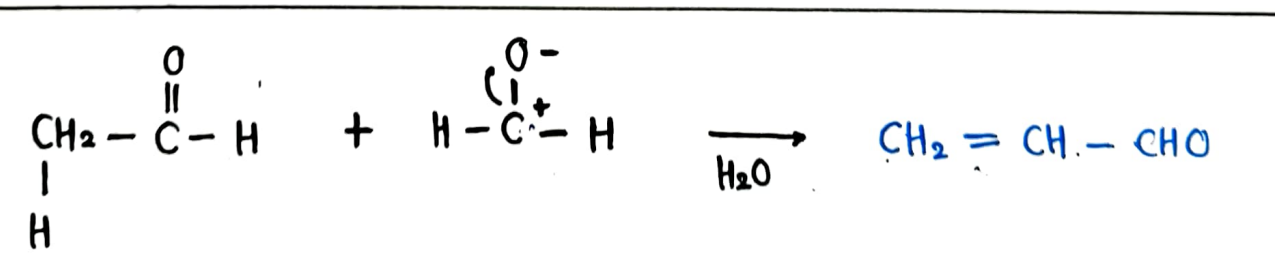
- When aldol condensation is carried out between two different aldehydes or ketones, then it is known as Crossed Aldol Condensation.
- Now if only one species will contain α - hydrogen then two products will be formed, while.
- If both the species contain α- hydrogen then 4 products will be formed.

- Lets assume we carried out our reaction b/w Formaldehyde (Methanal) & Acetaldehyde (ethanal), Now here acetaldehyde contains α hydrogen while formaldehyde don't so we get two products by the following reactions:

Reaction - I



Reaction - II



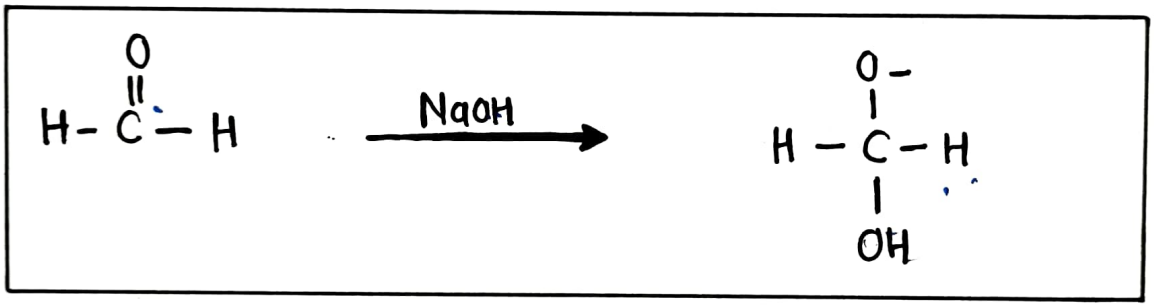
CANNIZARO REACTION

- Cannizaro reaction is a type of organic reaction in which reaction takes place between those aldehydes that do not contain α - hydrogen
- Reaction takes place only in the presence of concentrated base.

Mechanism

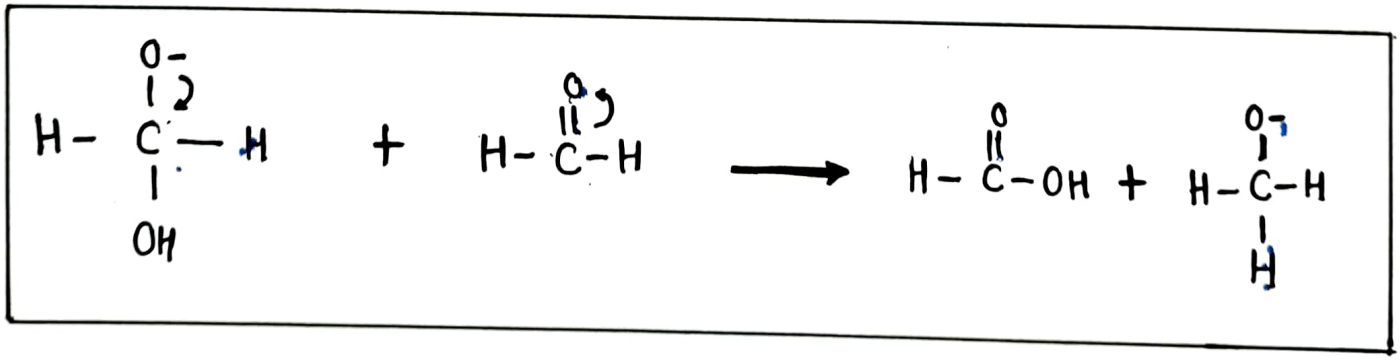
STEP-I

Attack of Hydroxide ion (OH^-) on aldehyde ~~group~~ compound.



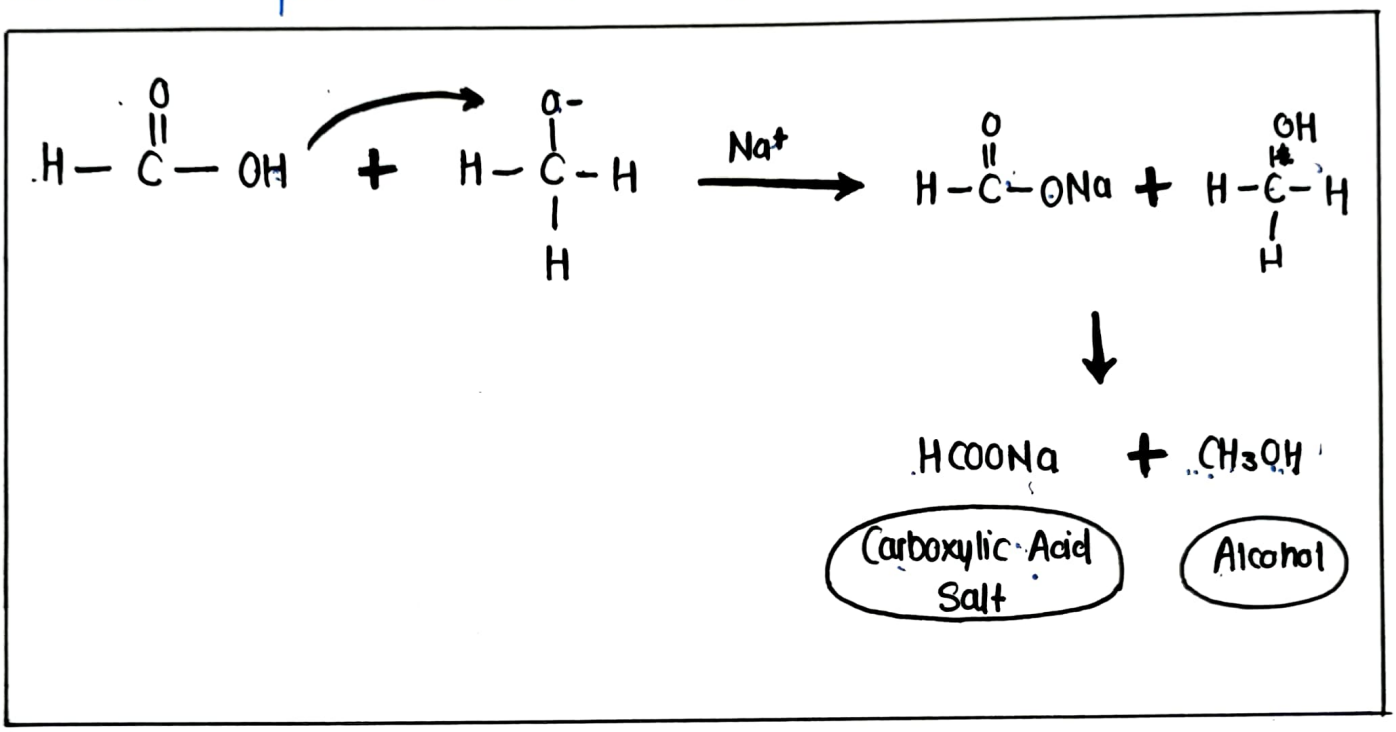
STEP-II

Hydride Shift



STEP - III

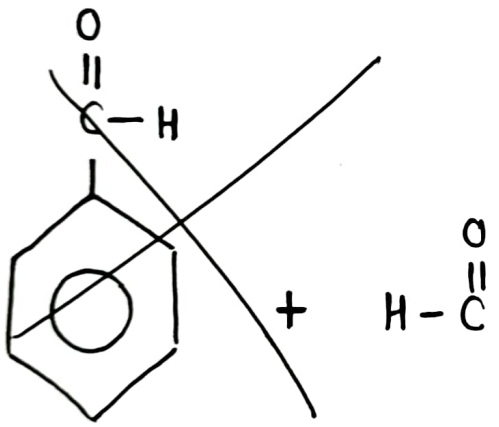
Transfer of proton & addition of Na^+



CROSSED CANNIZARO REACTION

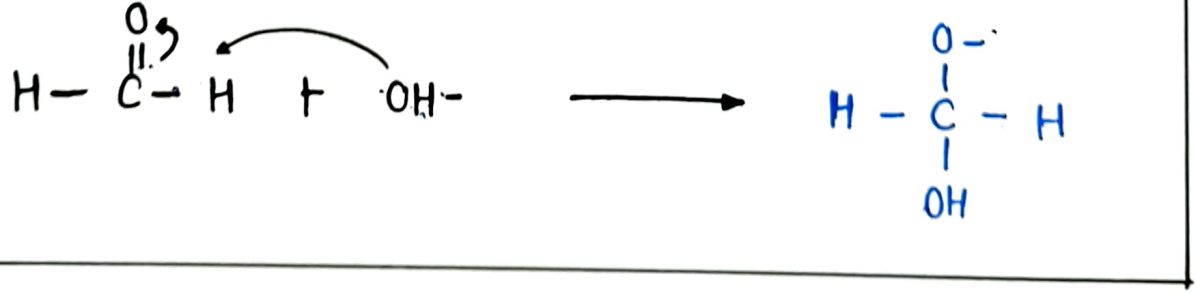
- Crossed cannizaro is also same as cannizaro reaction the main difference is here the reaction takes place blw two different aldehyde group not having α - hydrogen atom.
- Reaction takes place in the presence of concentrated base.
- The reaction mainly takes place blw formaldehyde & Benzaldehyde

STEP-I



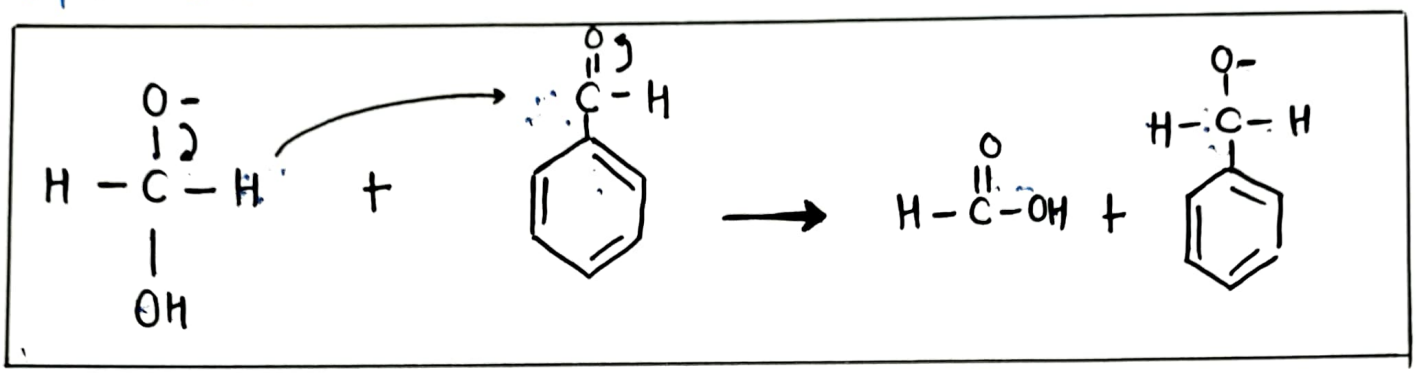
STEP-I

Attack of OH- on aldehyde



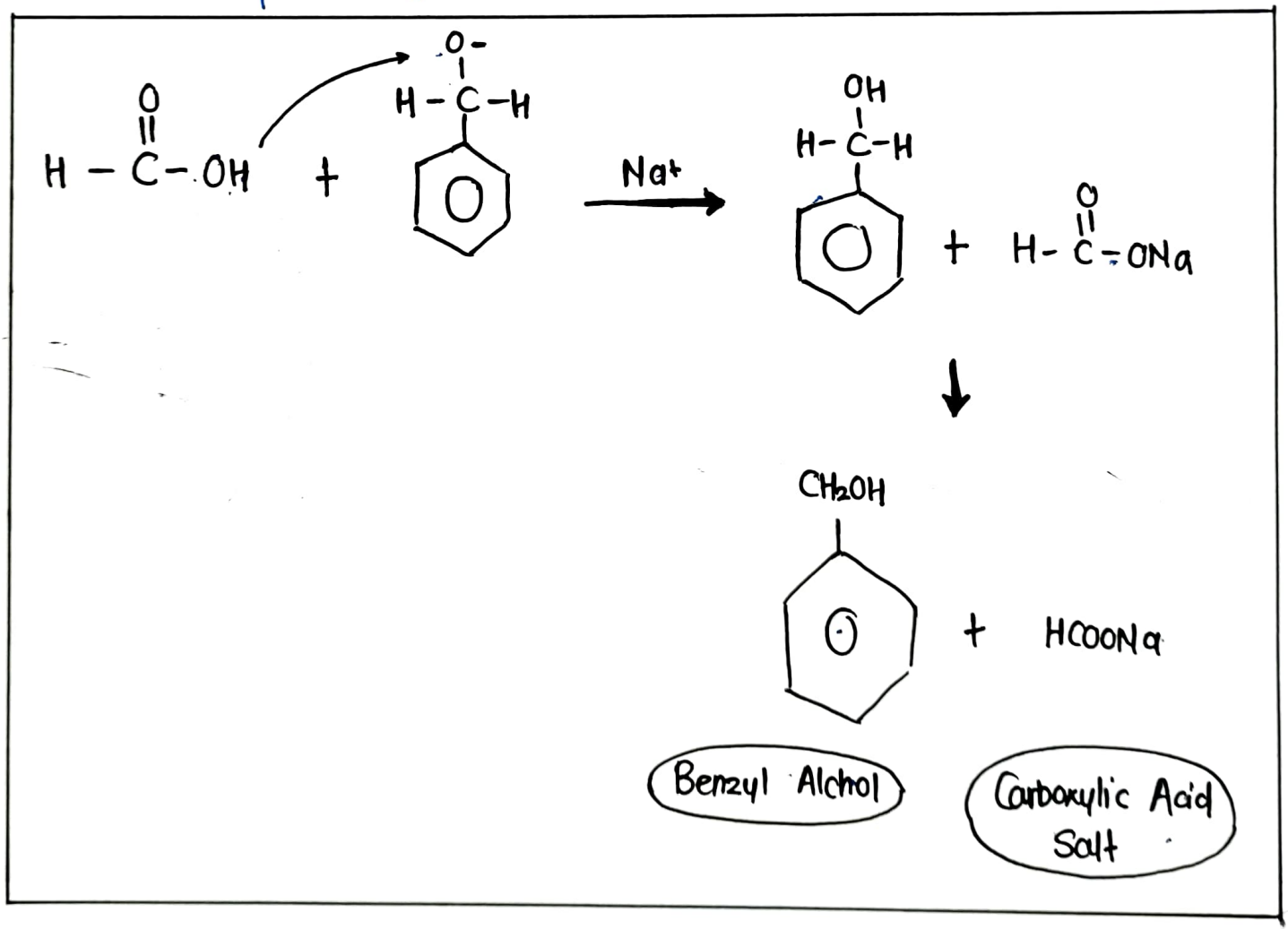
STEP-II

Hydride shift



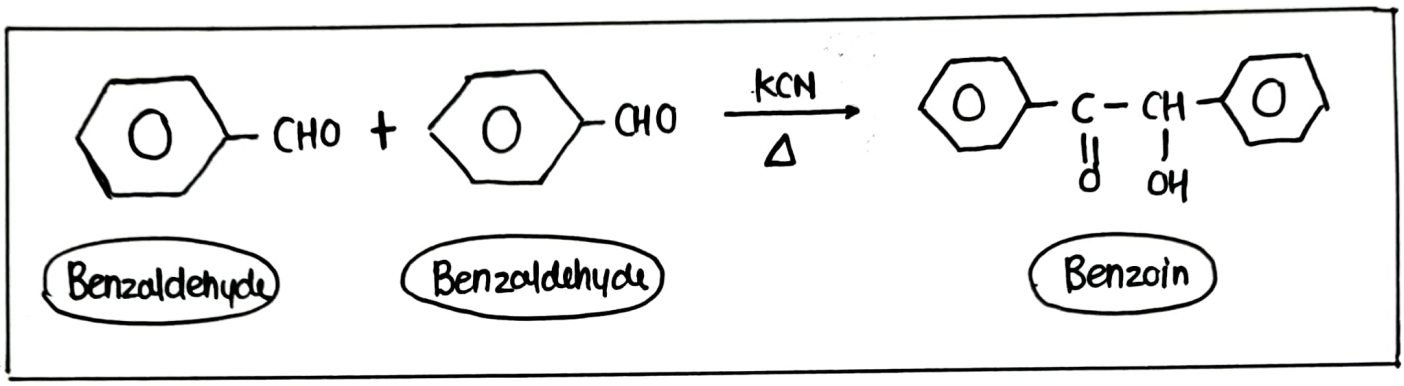
STEP-III

Transfer of proton & addition of Na^+



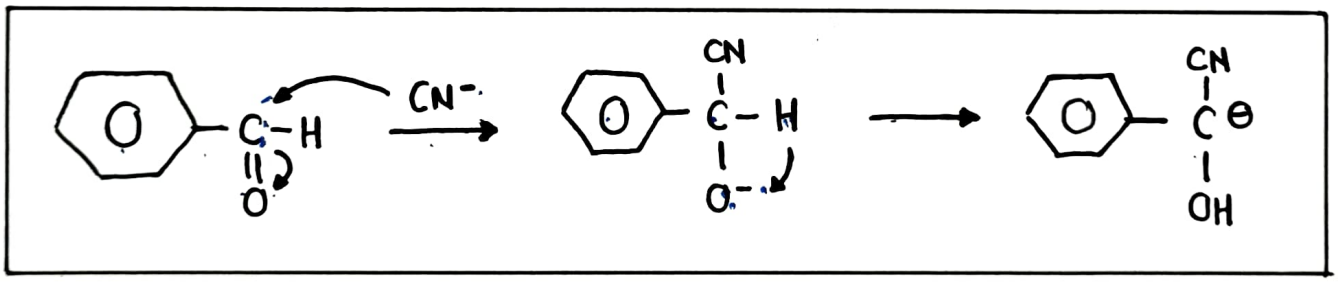
Benzoin Condensation

In benzoin condensation two moles of aromatic aldehydes (mainly benzaldehydes) reacts with each other in the presence of KCN (potassium cyanide) to form benzoin



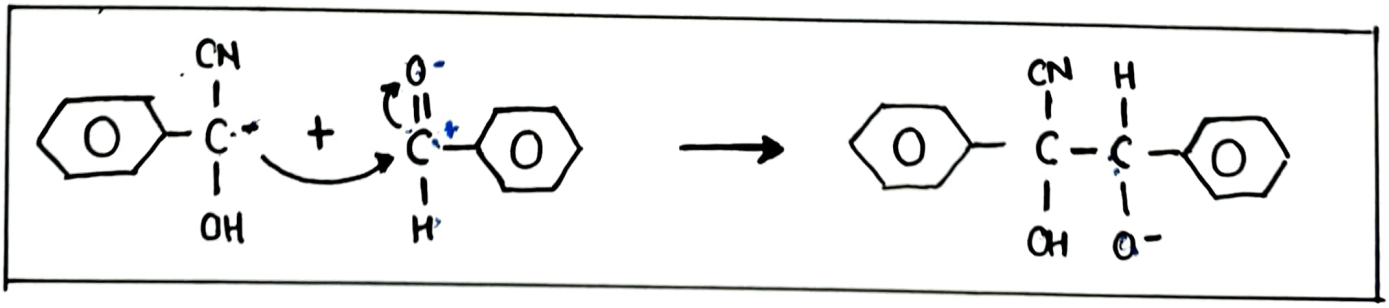
STEP-I

Cyanide ion attacks on benzaldehyde to form carbanion



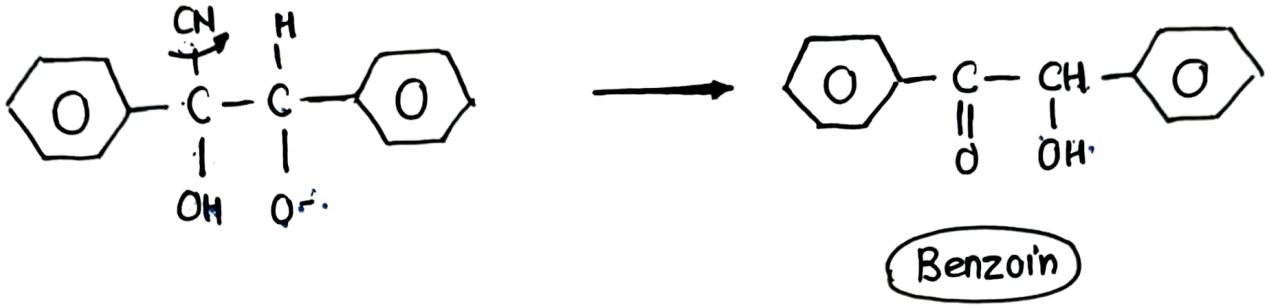
STEP-II

Carbanion attacks on second benzaldehyde to form intermediate.



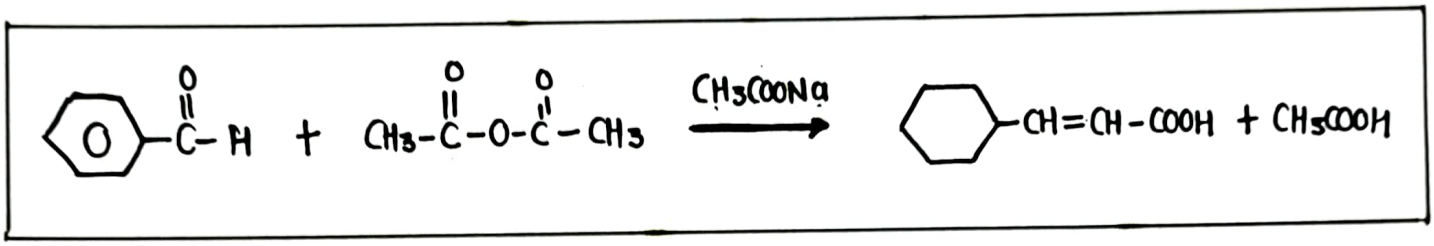
STEP - III

Removal of cyanide ion to form benzoin



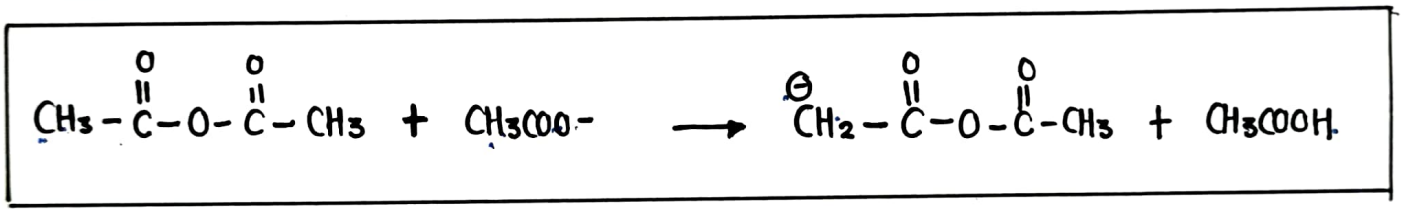
PERKIN CONDENSATION

In perkin condensation aromatic aldehyde (mainly benzaldehyde) reacts with acetic anhydride in the presence of carboxylic acid salt to form α, β unsaturated acid & acetic acid.

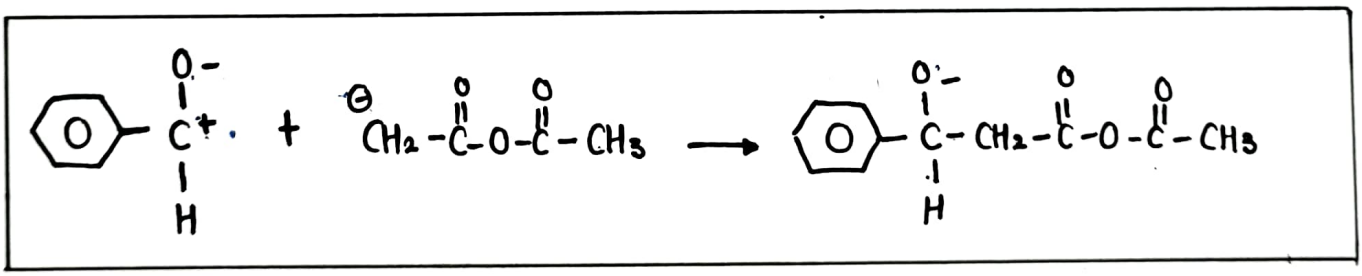


Mechanism

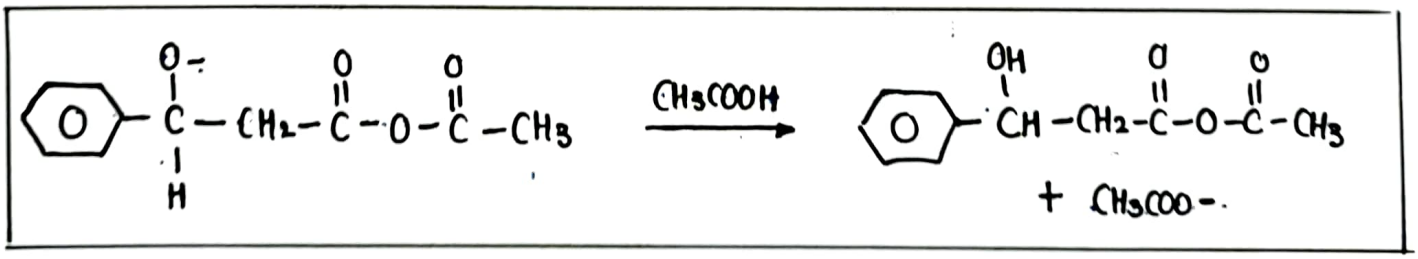
STEP-I



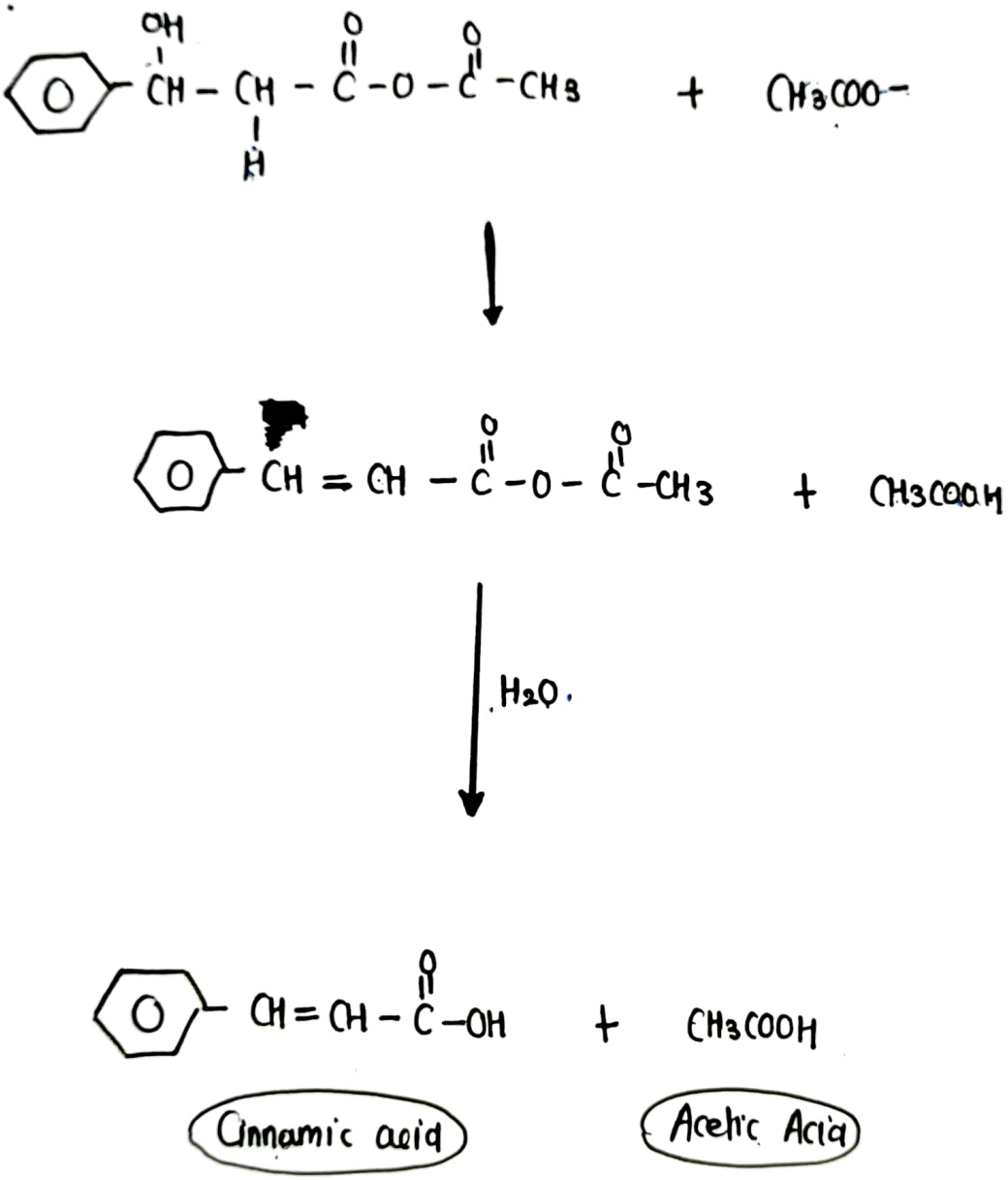
STEP-II



STEP-III



STEP-4


OH
O
O
CH – CH – C – O – C – CH3
H
+ CH3COO–
CH = CH – C – O – C – CH3
+ CH3COOH
H2O.
CH = CH – C – OH
+ CH3COOH
Cinnamic acid
Acetic Acid

QUESTION - 2

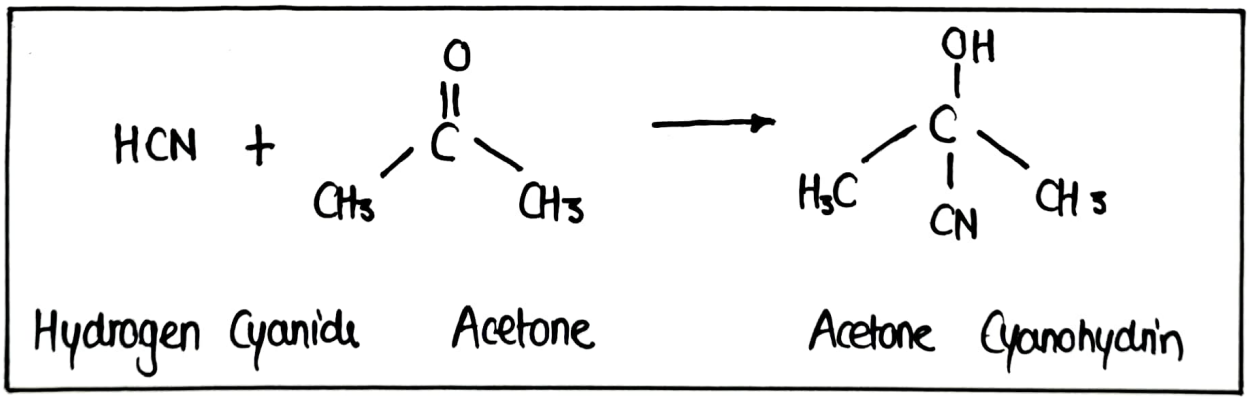
1 DISCUSS NUCLEOPHILIC ADDITION REACTION OF ALDEHYDE AND KETONES

Nucleophilic Addition Reaction of Aldehyde & ketones

- Aldehyde & ketones are highly reactive compounds.
- Both Aldehyde & ketones undergo nucleophilic addition reaction because of electrophilic nature of carbon of carbonyl group
- As the oxygen atom of both Aldehyde & ketones is more electronegative, therefore it pulls the electron around itself acquiring a partial negative charge (δ^-), whereas a partial positive charge (δ^+) is developed on carbon atom.
- The positively charged carbon atom of carbonyl group is then readily attacked by nucleophiles.

Example: Reaction with Hydrogen Cyanide HCN

- Aldehyde & ketones undergo a nucleophilic addition reaction with HCN.
- The nucleophile in this reaction is a cyanide ion $-C\equiv N$.

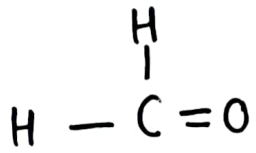


QUESTION - 3

3 WRITE A SHORT NOTES ON STRUCTURE AND USES OF :

- **FORMALDEHYDE**
- **BENZALDEHYDE**
- **VANILINE**

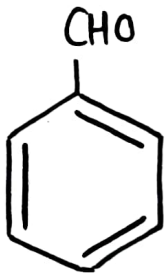
① Formaldehyde



Uses

- It is commonly used as preservatives.
- It is also used as disinfectants
- It is used as local anaesthetics
- It is used in textile industry
- It serves as building block for synthesis of various chemicals.

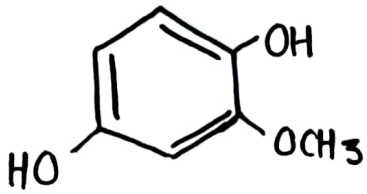
② Benzaldehyde



Uses

- Benzaldehyde is used as flavouring Agent.
- It is used in production of various medicines
- It is also used in industrial process.
- It is used as precursor for synthesis of various chemicals.

③ Vaniline



Uses

- Vaniline is used as flavouring agent.
- It is also used as fragrance in various perfumes.
- It is used for synthesis of various medications.
- It is also used in various cosmetics

THANK YOU

FOR CHOOSING IMPERFECT PHARMACY AS YOUR STUDY PARTNER

IMPERFECT PHARMACY

JOIN US ON :

- IMPERFECT PHARMACY
- IMPERFECT PHARMACY
- @IMPERFECTPHARMA
- IMPERFECT PHARMACY
- @IMPERFECTPHARMACY
- IMPERFECT PHARMACY

IMPERFECTPHARMACY@GMAIL.COM