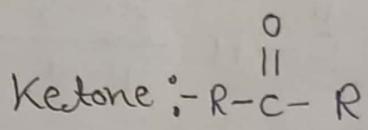
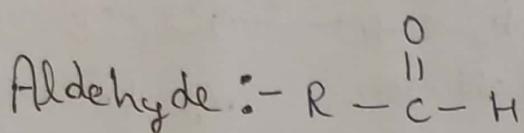


Carbonyl Compounds

(Aldehydes & Ketones)



Common and IUPAC names of some Aldehydes :-

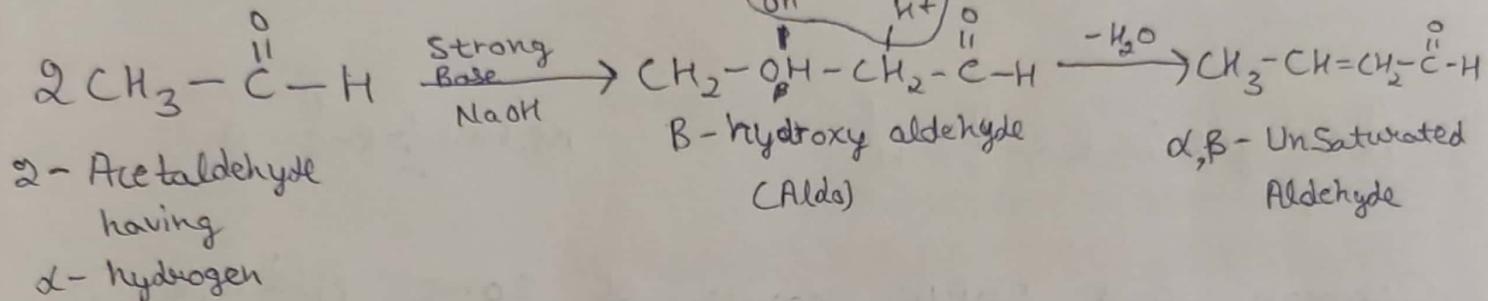
Compound	Common Name	IUPAC
(i) $\text{H} - \overset{\text{O}}{\underset{\parallel}{\text{C}}} - \text{H}$	Formaldehyde	Methanal
(ii) CH_3CHO	Acetaldehyde	Ethanal
(iii) $\text{CH}_3\text{CH}_2\text{CHO}$	Propionaldehyde	Propanal
(iv) 	Benzaldehyde	Benzene Carbaldehyde

Common and IUPAC names of some Ketones :-

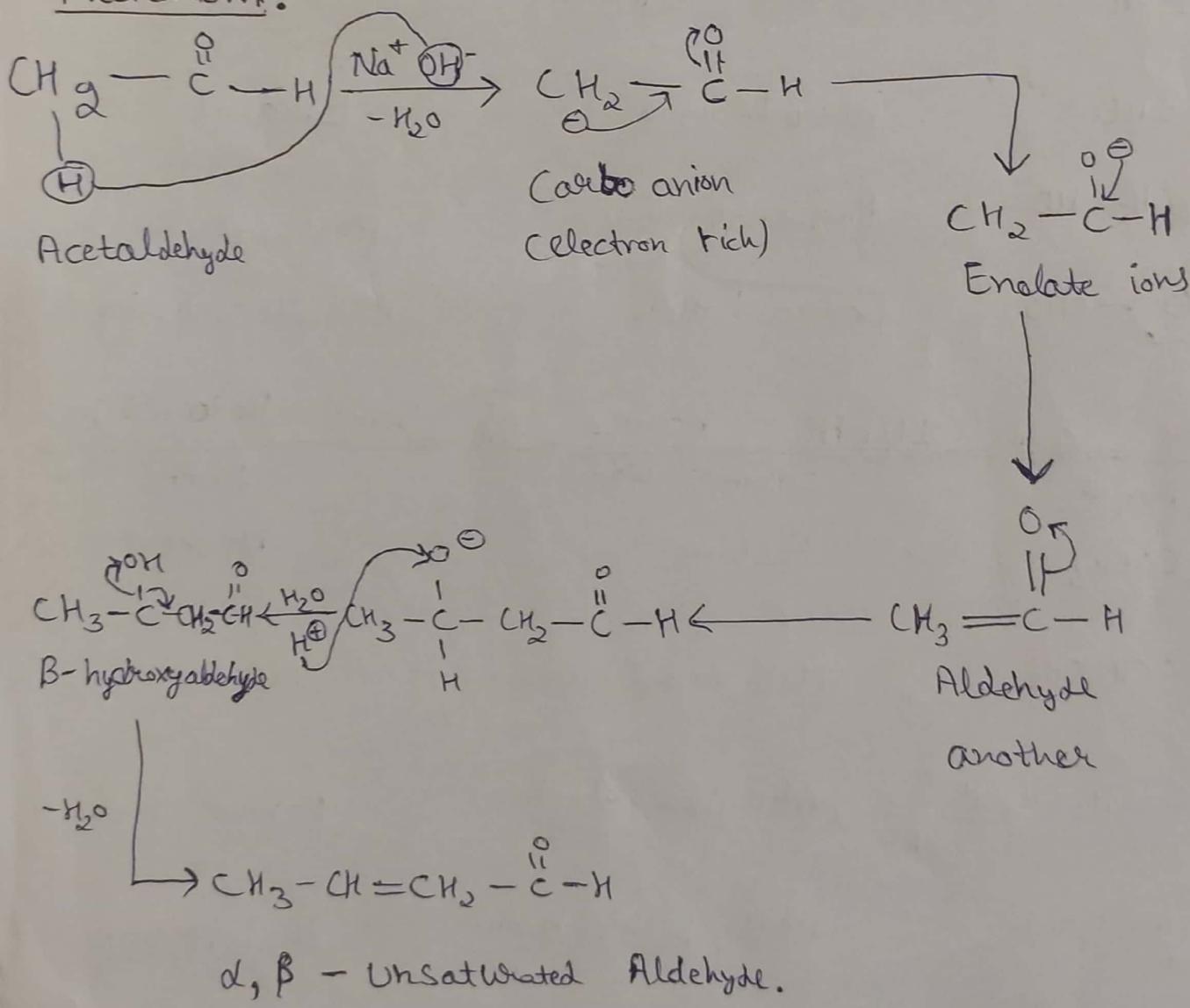
Compound	Common Name	IUPAC
(i) CH_3COCH_3	Acetone	Propanone
(ii) $\text{CH}_3\text{COCH}_2\text{CH}_3$	Methylethyl Ketone	Butanone
(iii) $\text{CH}_3\text{COCH}_2\text{CH}_2\text{CH}_3$	Methylpropyl Ketone	Pentan-2-one
(iv) 	Methylphenyl Ketone	Acetophenone

Aldol Condensation :-

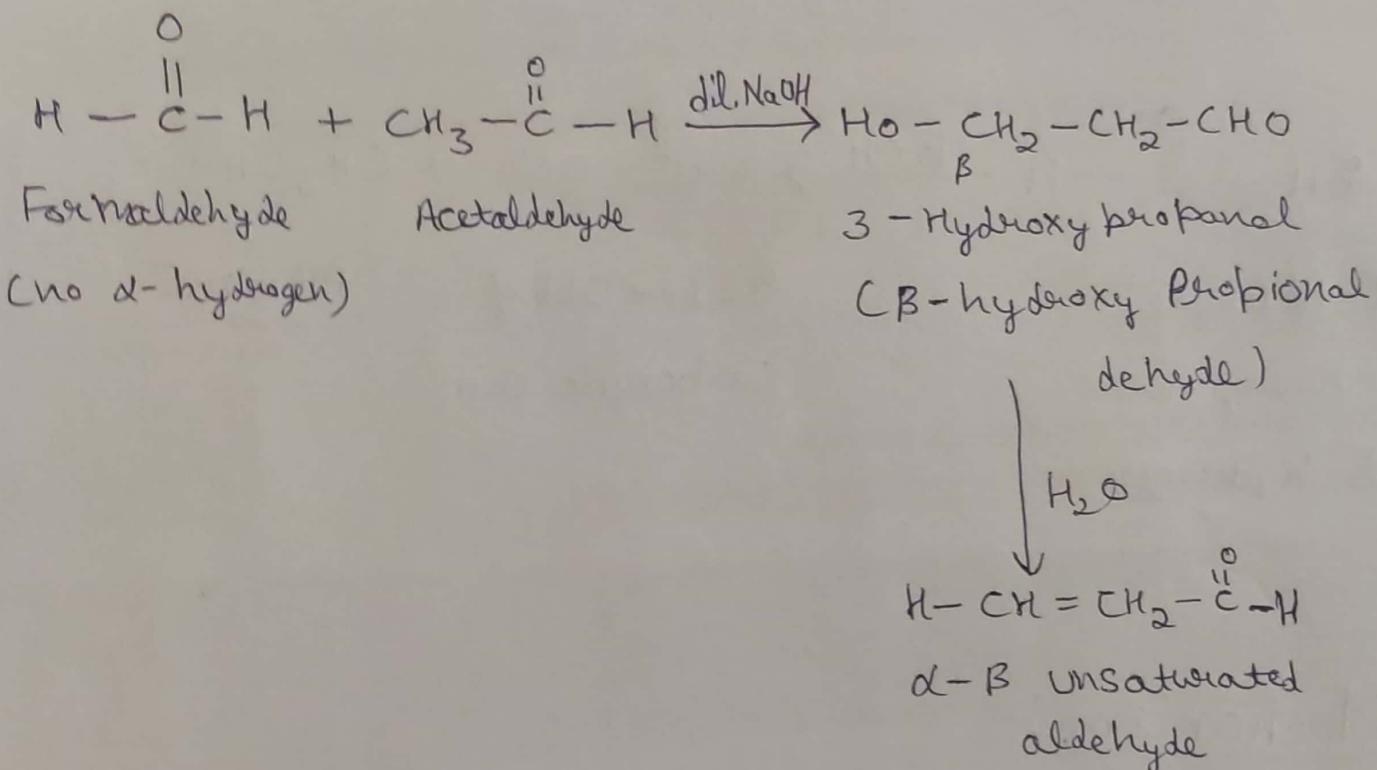
Reaction :-



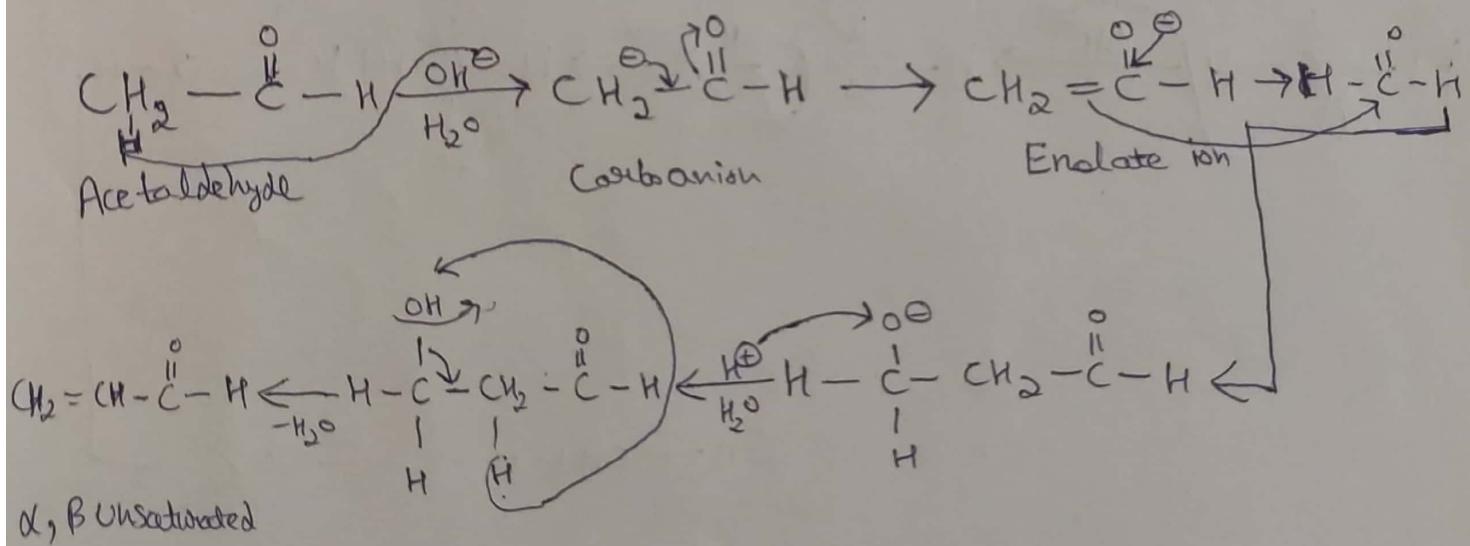
Mechanism :-



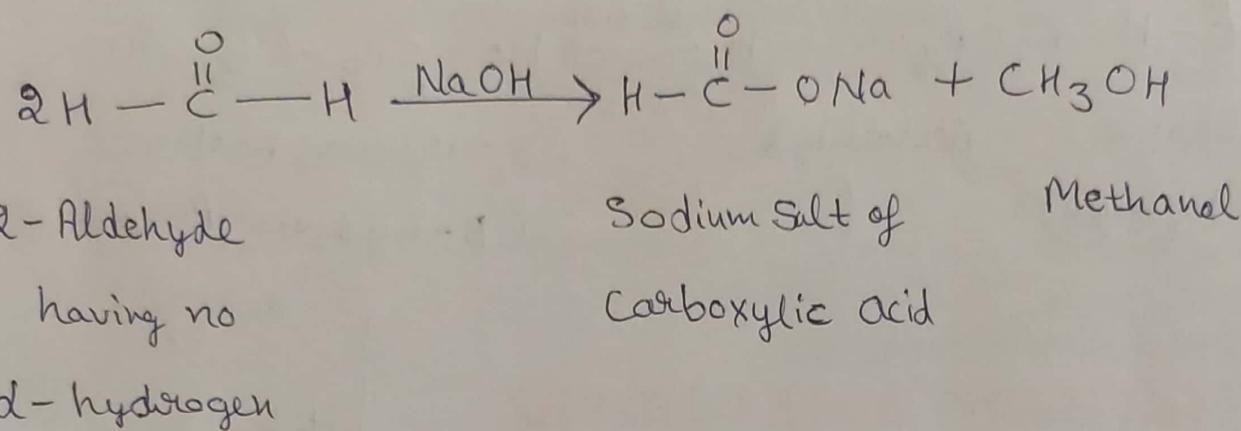
Cross al del Condensation or Mixed Condensation



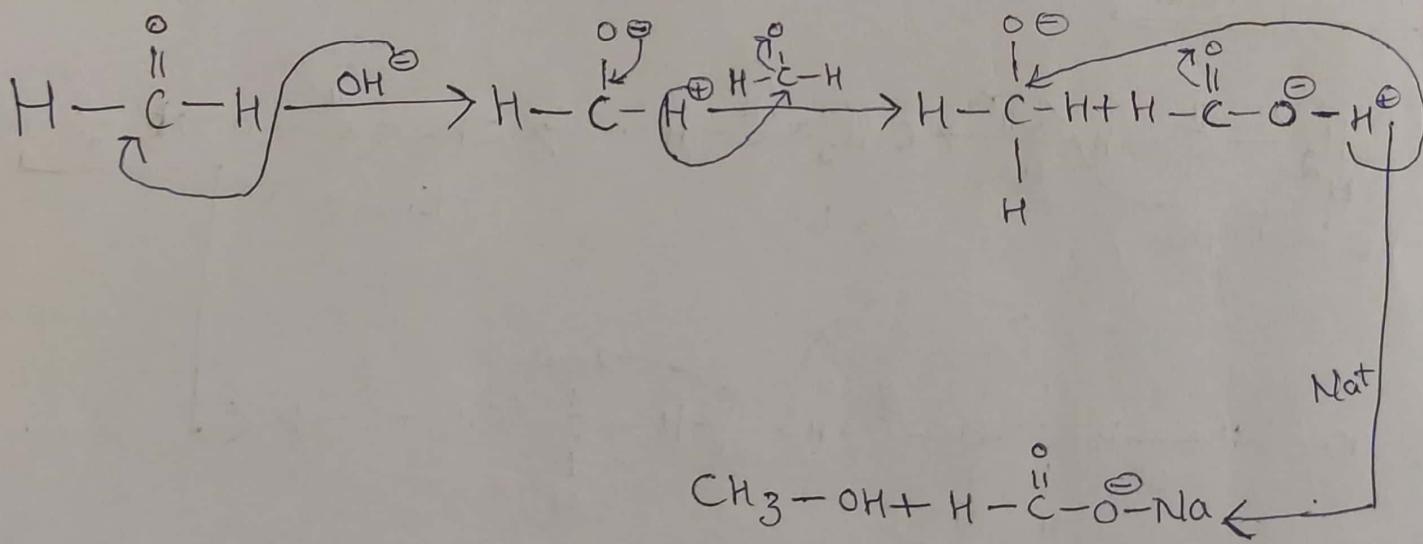
Mechanism :-



Cannizzaro Reaction :-

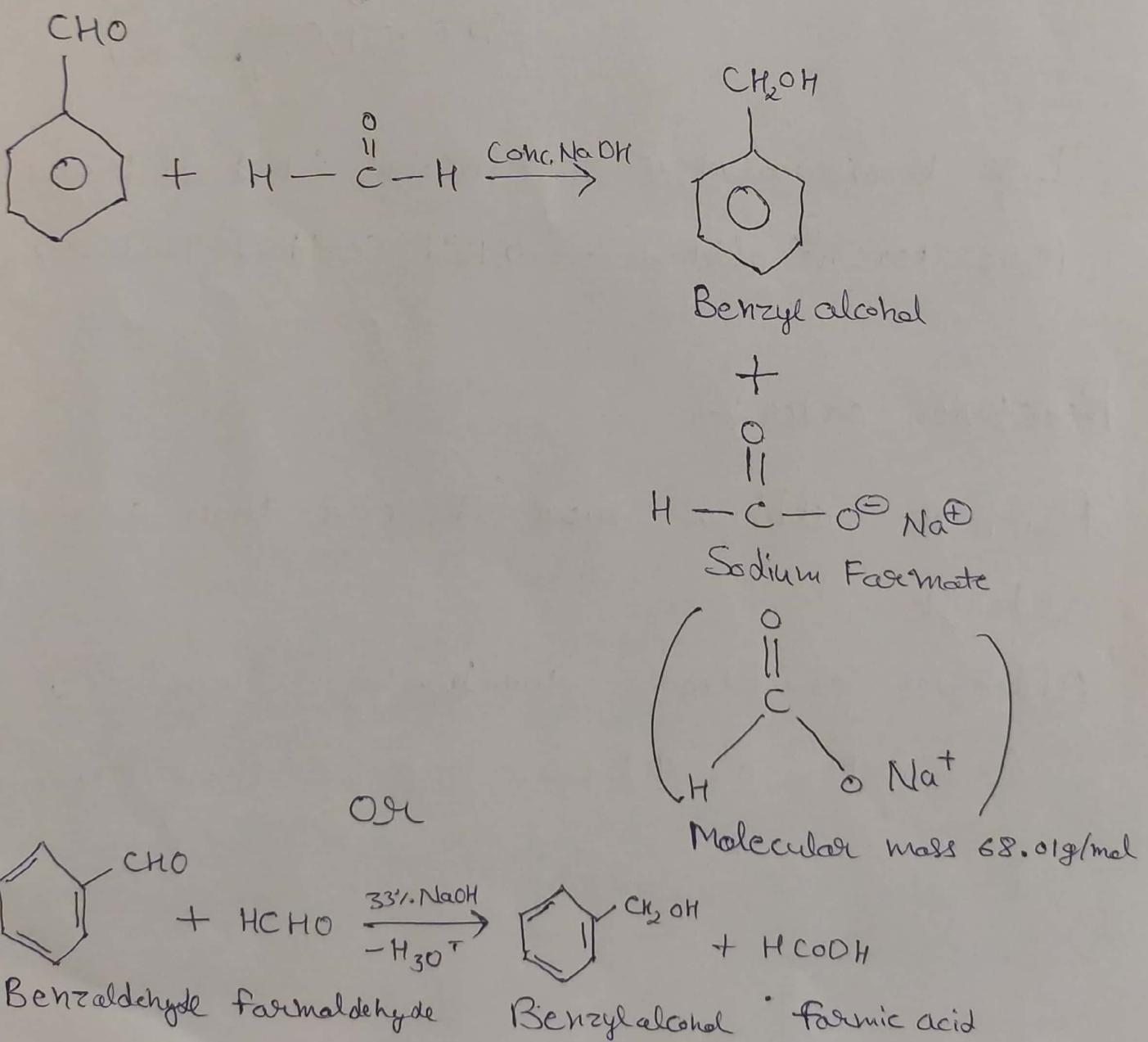
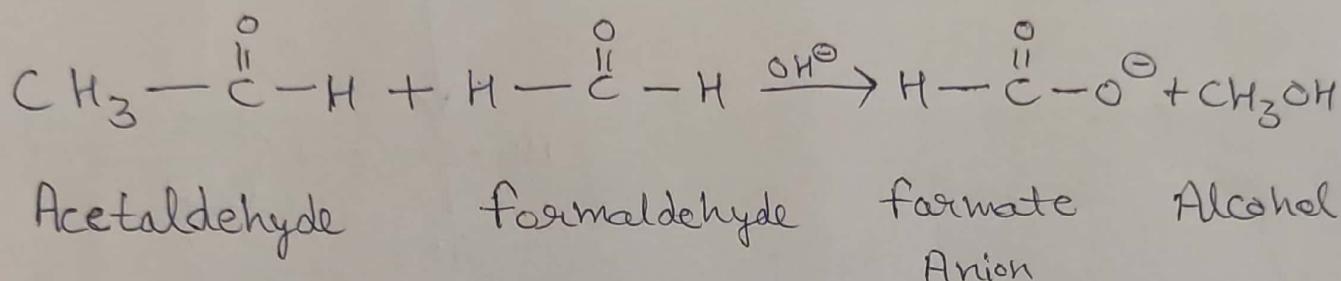


Mechanism:-

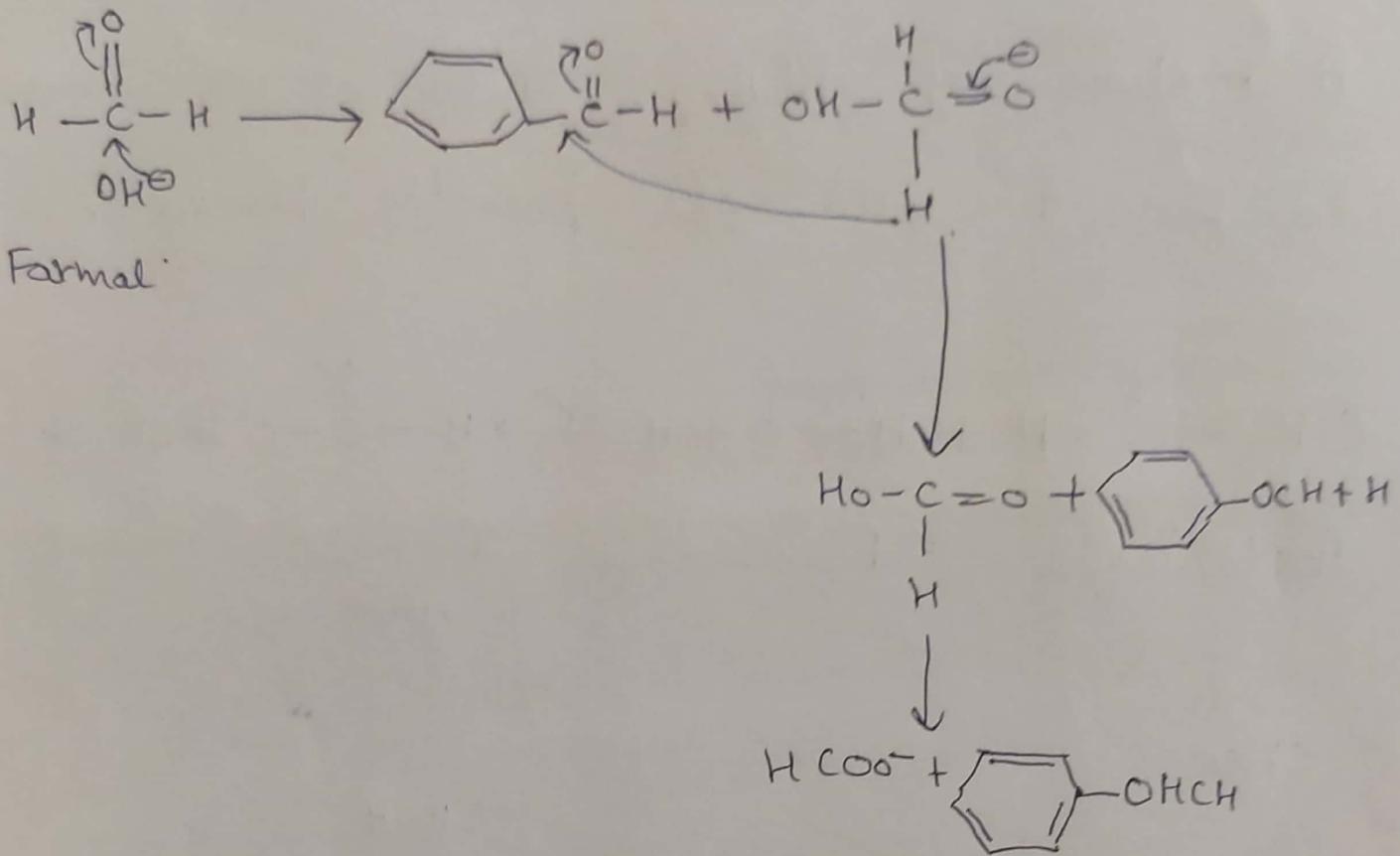


Cross Cannizzaro Reaction :-

A mixture of Aldehyde undergoes a Cannizzaro's reaction to yield all possible products.



Mechanism:-



Less reactive aldehyde \rightarrow Alcohol (Reduced product)

More reactive aldehyde \rightarrow Acid (Oxidised product)

Reactivity order:-

Aliphatic aldehyde more reactive than aromatic aldehyde

Aldehydes of Electron withdrawing group

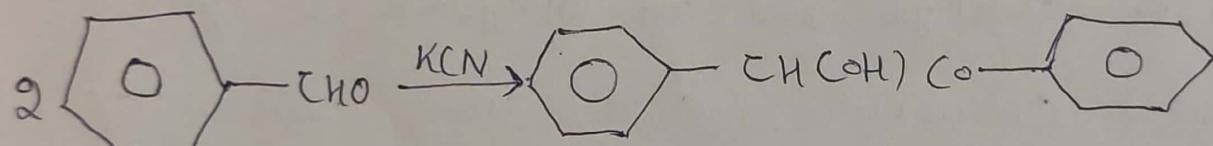
(-I, -M, -R, -H) more reactive than Electron donating group.

Benzoin Condensation:-

It is an important reaction in which Carbon-Carbon bond is formed when two molecules of aldehyde reacts with each other to form a condensed product called Benzoin.

This reaction is named after Friedrich Wuehler and Justus von Liebig in 1832.

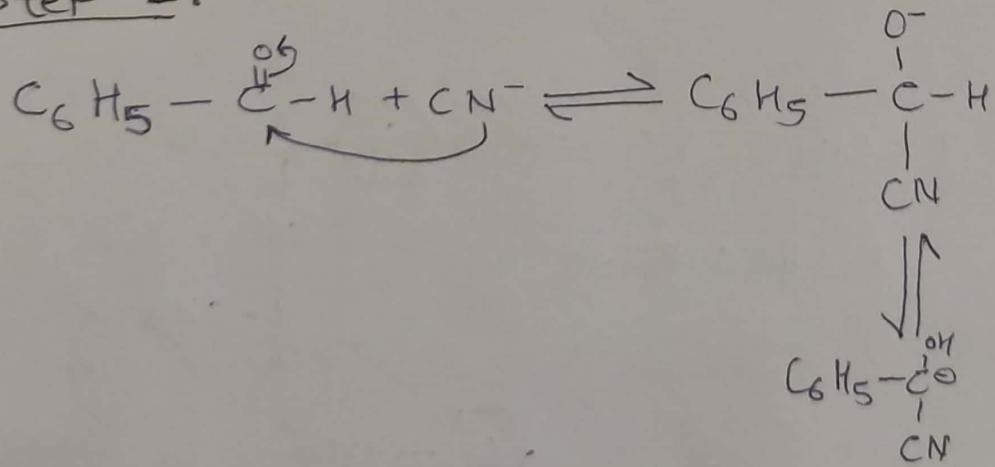
This reaction is catalysed by Cyanide ion.



2-Benzaldehyde

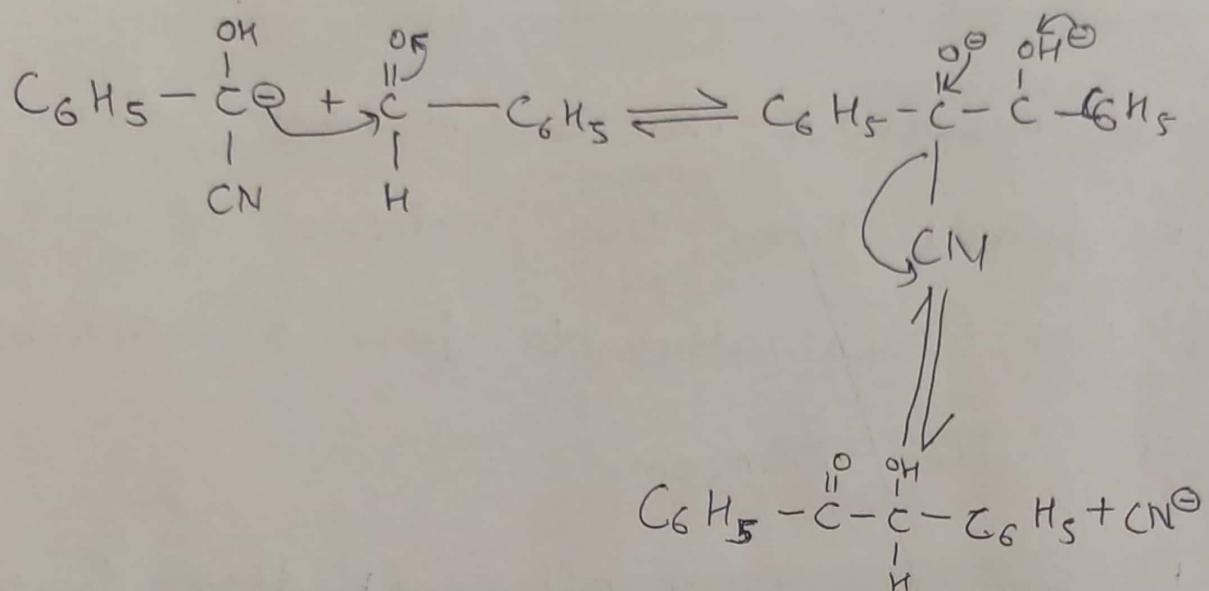
Mechanism:-

Step-I:-



(8)

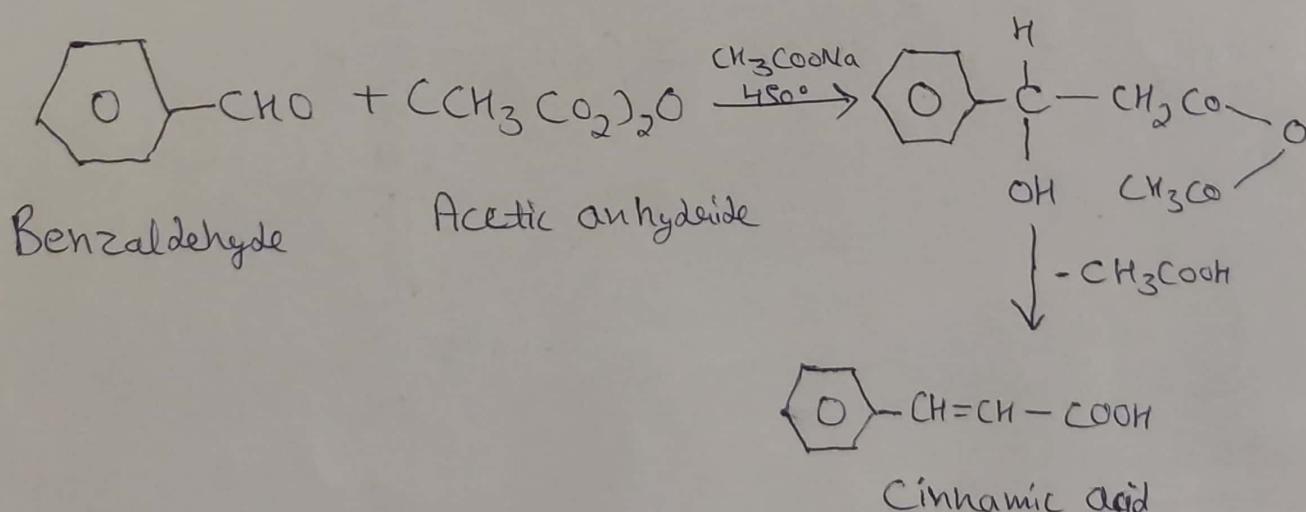
Step-II:-



Perkin Condensation :-

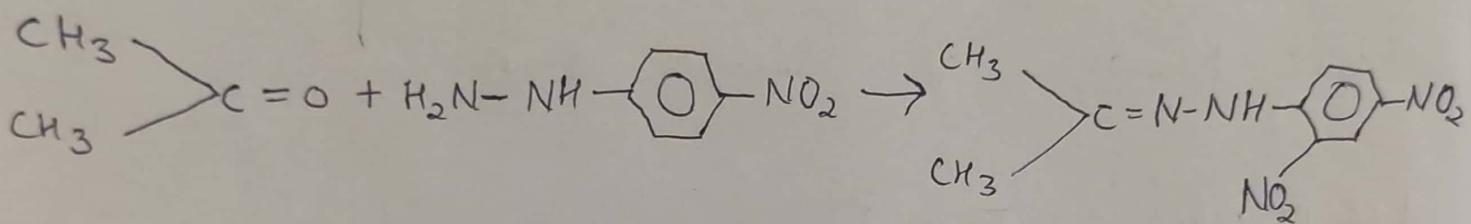
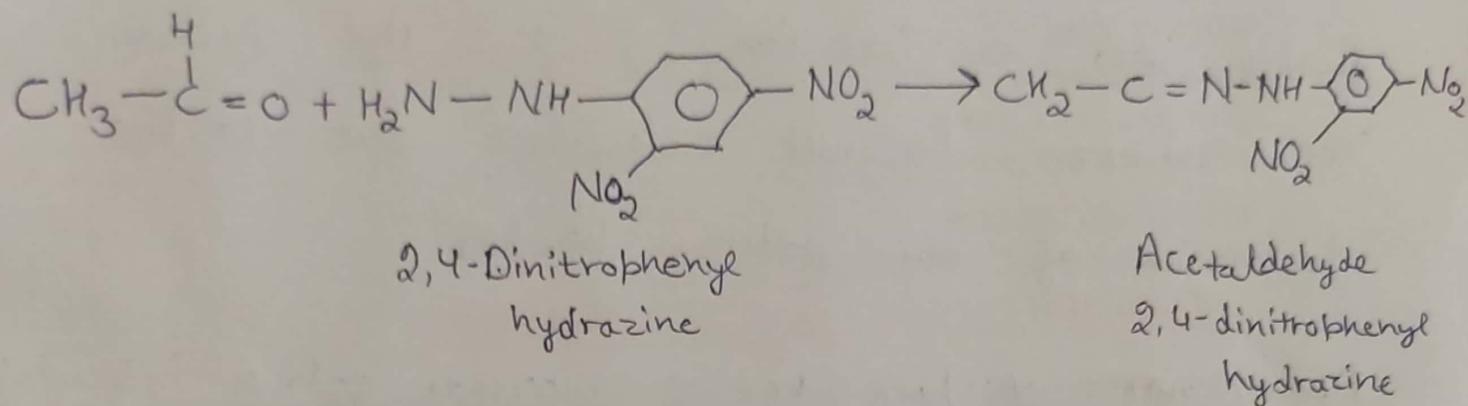
It is an organic reaction used to convert an aromatic aldehyde and an anhydride to an α, β -unsaturated carboxylic acid using sodium acetate, a base and an acid work up.

This reaction is developed by Sir William Henry Perkin that is used to make cinnamic acid.



Qualitative tests for Ketones & Aldehydes:-

1. 2,4-Dinitrophenylhydrazine (2,4-DNP) Test :-



0.5ml/0.5g sample + Rectified spirit to dissolve + few drops of 2,4-DNP, cork and shake, allow to stand for 5min.

Formation of yellow or orange crystal indicated presence of carbonyl groups.

2. Sodium Bisulfite Test:-

Aldehydes and ketones combine with sodium bisulfite to form well crystallized water soluble products known as "aldehyde bisulfite" and "ketone bisulfite" leads to formation of crystalline precipitate which confirm the presence of carbonyl group.

(10)

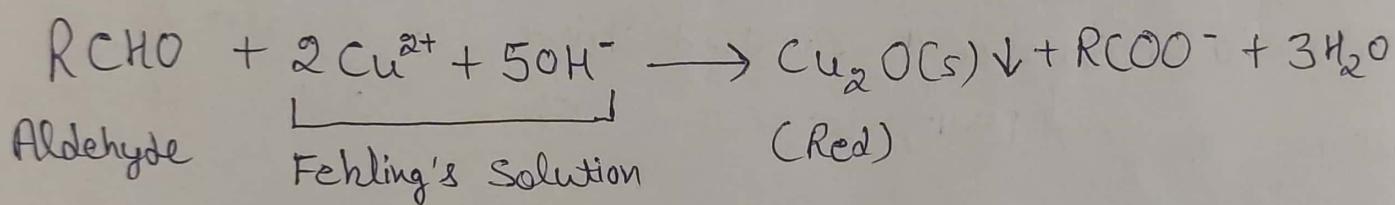
Distinguishing Test between Aldehydes and Ketones:

3. Schiff's Test :-

Schiff's reagent is prepared by passing Sulphur dioxide into a solution of the dye fuchsin. The solution becomes colourless due to the formation of an addition product.

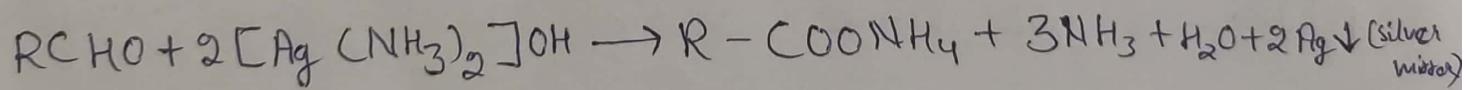
Appearance of pink, red or magenta colour indicates the presence of aldehyde group.

4. Fehling's Test :-



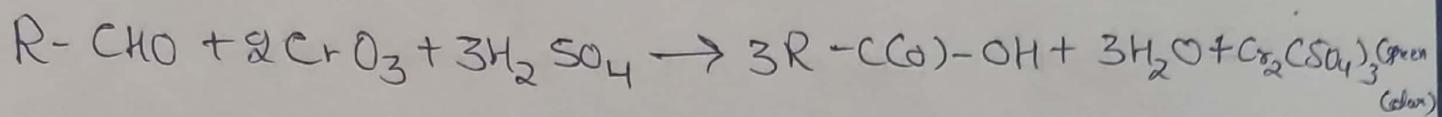
Appearance of red precipitate confirms the presence of aldehydic groups.

5 Tollen's Test :- (Silver mirror Test)



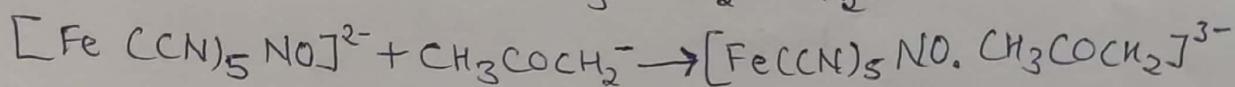
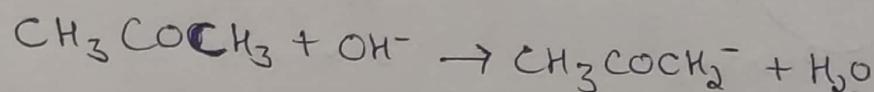
The appearance of shiny silver mirror confirms the presence of aldehydes.

6. Test with chromic Acid :-



The appearance of green or blue colour precipitate confirms the presence of aldehydes.

7. Sodium Nitroprusside Test :-



The appearance of red coloration shows the presence of Ketone.

Electromeric Effect :-

It is shown by compounds having multiple bonds.

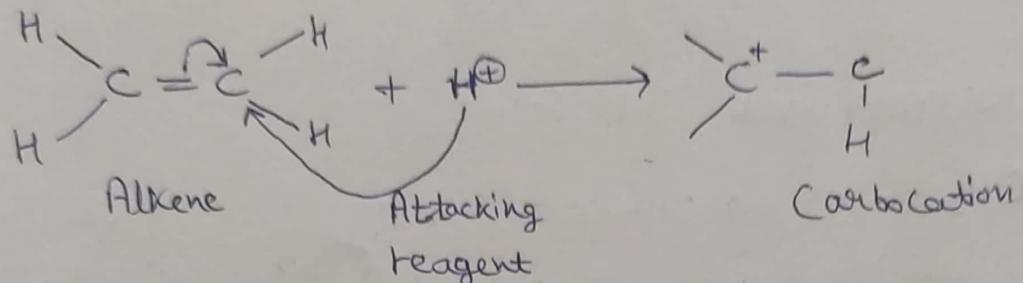
When a particular double or triple bond is attacked by a reagent, a pair of bonding electrons involved in π -bond formation gets transferred completely from one atom to another.

The molecule becomes polarised for a time but when the reagent is removed, the polarised molecule comes back to original state. So, there occurs an intramolecular electron displacement.

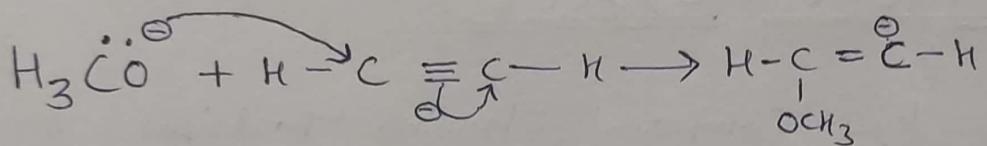
Electromeric Effect is of two types :-

(i) +E Effect :- when electron pair moves towards the attacking reagent.

For e.g.:- addition of acids to alkenes.

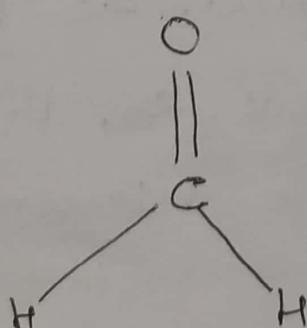


(ii) -E Effect :- In which π -electrons of the multiple bond gets transferred to the atom to which the reagent do not get attached.



Formaldehyde (HCHO) :-

It is naturally occurring organic compound of general formula HCHO . It is also known as methanal and is the simplest aldehyde. It is generally used for synthesis of various chemical compounds.



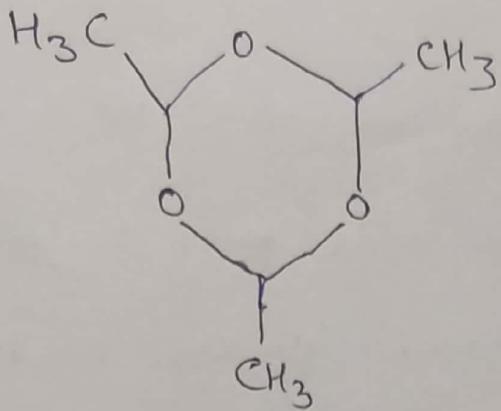
Uses of Formaldehyde :-

- ① It is used in the treatment of warts and some parasites.
- ② Used as an antiseptic, as it kills most bacteria and fungi.
- ③ It is used in some personal hygiene products to prevent bacterial growth.
- ④ It is used to produce materials used in numerous parts of car manufacture.
- ⑤ It is used in the production of plywood, carpeting, and building insulation.
- ⑥ It is used to make chemicals used in paints and explosives.
- ⑦ It is used in the development of some types of photography film.

Paraldehyde :-

Paraldehyde is the cyclic trimer of acetaldehyde molecules. It is colourless liquid, that is sparingly soluble in water and highly soluble in ethanol.

Paraldehyde slowly oxidizes in air, turning brown and producing an odour of acetic acid. It quickly reacts with most plastics and rubber.

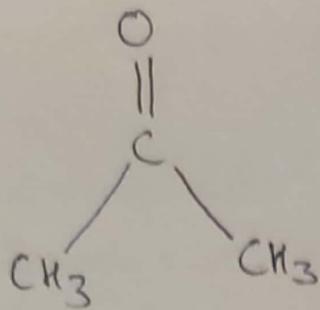


Uses:-

- ① It is used as anticonvulsant, hypnotic and sedative.
- ② It has been used in the treatment of convulsions.
- ③ Paraldehyde is used in resin manufacture, as a preservative, MEP and in other processes as a solvent.
- ④ It has been used in the generation of aldehyde fuchsin.
- ⑤ Paraldehyde is used as an ingredient in some cough medicines as an expectorant.

Acetone :-

Acetone is a colorless, flammable liquid that evaporates easily. It is an organic compound because carbon atoms are present in acetone's chemical formula, which is (CH₃)₂O

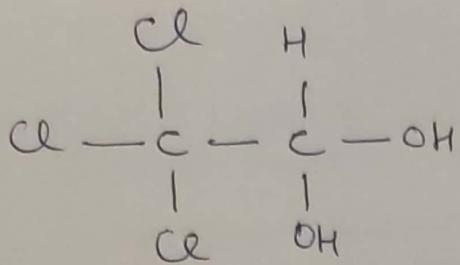


Uses :-

- ① It is a good solvent for many plastic and Synthetic fibers.
- ② It is used as an Excipient in many pharmaceutical preparations.
- ③ It is used as a Solvent in nail polish removers cement, paint films.
- ④ It is also serves as a drying agent.
- ⑤ It is used to clean laboratory equipments.
- ⑥ In order to conduct reaction at low temperature acetone dry ice is used.
- ⑦ It is also used in chemical peeling

Chloral Hydrate :-

Chloral hydrate is a general diss. It is a colorless solid. It is derived from chloral (trichloroacetaldehyde) by the addition of one equivalent of water. Chloral hydrate is soluble in both water and ethanol, readily forming concentrated Solutions.

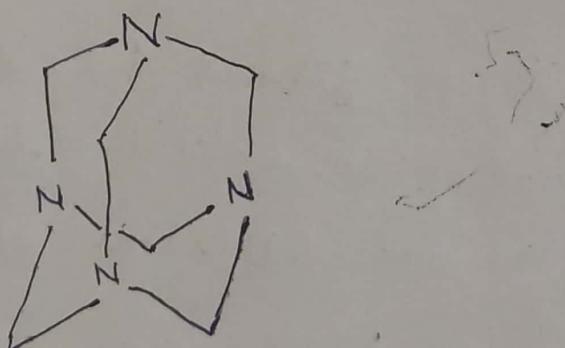


Uses:-

- ① Chloral hydrate is for short-term use as a sedative or sleep medicine. It is sometimes given before a surgery to help you relax.
- ② Chloral hydrate is a starting point for the synthesis of other organic compounds.
- ③ It is used in the treatment of insomnia.
- ④ It is useful ingredient for microscopic investigation of seeds, ferns, small mites etc.

Hexamine

It is also known as Hexamethylenetetramine or Methenamine. It is a heterocyclic organic compound with the formula $(\text{CH}_2)_6\text{N}_4$.

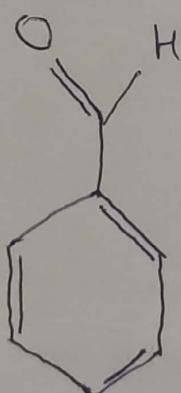


Uses :-

- ① Hexamine is used for the treatment of urinary tract infection.
- ② It is used as a food additive and as a preservative.
- ③ It is also used in the treatment of phosgene poisoning.
- ④ It is also used as a explosive. It is the basic component of RDX.

Benzaldehyde :-

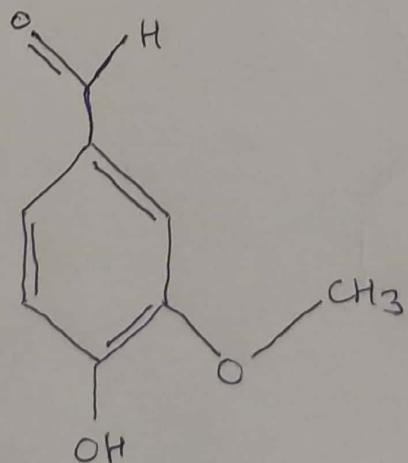
Benzaldehyde (C_6H_5CHO) is an organic compound consisting of a benzene ring with a formyl substituent. It is the simplest aromatic aldehyde and one of the most industrially useful. It is a colorless liquid with a characteristic almond-like odor.



Uses :-

- ① It is used in place of almond to provide almond flavour.
- ② It is sometimes used in cosmetics products.
- ③ It is used as a bee repellent.
- ④ It is used as a solvent, low temperature lubricant and as a plasticizer.
- ⑤ It is used in the preparation of various dyes like malachite green dye etc.
- ⑥ It is used as a raw material for many medicines, resins and perfumes.
- ⑦ It is used in the manufacturing of Soab, benzoin.

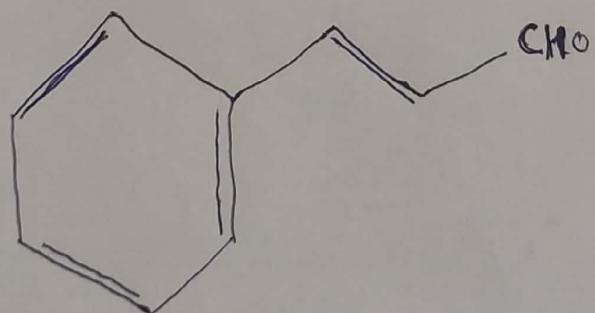
Vanillin :- is an organic compound with the molecular formula $C_8H_8O_3$. It is a phenolic aldehyde. Its functional groups include aldehyde, hydroxyl and ether. It is the primary component of the extract of the vanilla bean.



Uses :-

- ① It is mostly used as a flavouring agent in food items in the creams, chocolate, baked goods and confectionaries.
- ② It is used as a fragrance in perfumes.
- ③ It is also used to mask the bitter taste of medicines.
- ④ It is used as an antioxidant in various food items.
- ⑤ It is used in different cleaning products like toothpaste.
- ⑥ It is used as a visualising agent in TLC.

Cinnamaldehyde :- is an organic compound with the formula $C_6H_5CH=CHCHO$. occurring naturally as predominantly the trans (E) isomer, it give cinnamon its flavor and odor. It is a phenylpropanoid that is naturally synthesized by the shikimate pathway.



Uses:-

- ① Cinnamaldehyde is used as flavouring in chewing gum, ice cream, candy, eliquid and beverages.
- ② It is used in the treatment of diarrhoea and arthritis.
- ③ In agriculture it is used as fungicides and insecticides.
- ④ It is used in ~~the~~ perfumes for its pleasant smell.
- ⑤ It has antioxidant properties.
- ⑥ It is good inhibitor for steel and other ferrous alloys.