

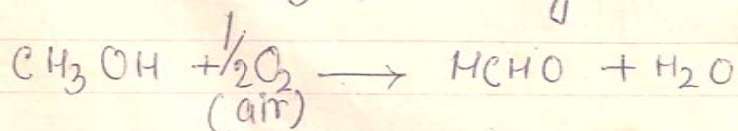


## ALDEHIDE

Formaldehyde (HCHO <sup>40%</sup> formalin)

- How is formaldehyde prepared in the lab.
- Why it is never prepared in pure form.
- Discuss the properties and mention its uses.

mp  
95°C Theory → When a mixture of air and Methyl alcohol vapour is passed through a tube containing <sup>heated</sup> platinum spring, <sup>heat</sup> due to oxidation  $\text{CH}_3\text{OH}$  is changed into formaldehyde.



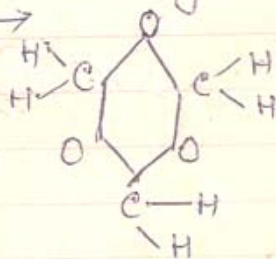
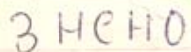


**Procedure** → In a round bottom flask about 50 cc of  $\text{CH}_3\text{OH}$  is taken. The flask is fitted with an inlet tube for incoming of air. It is fitted with a delivery tube connected to a big glass tube containing a platinum spiral (spiral) the other end of the big tube is connected to a delivery tube leading to water taken in a conical flask.

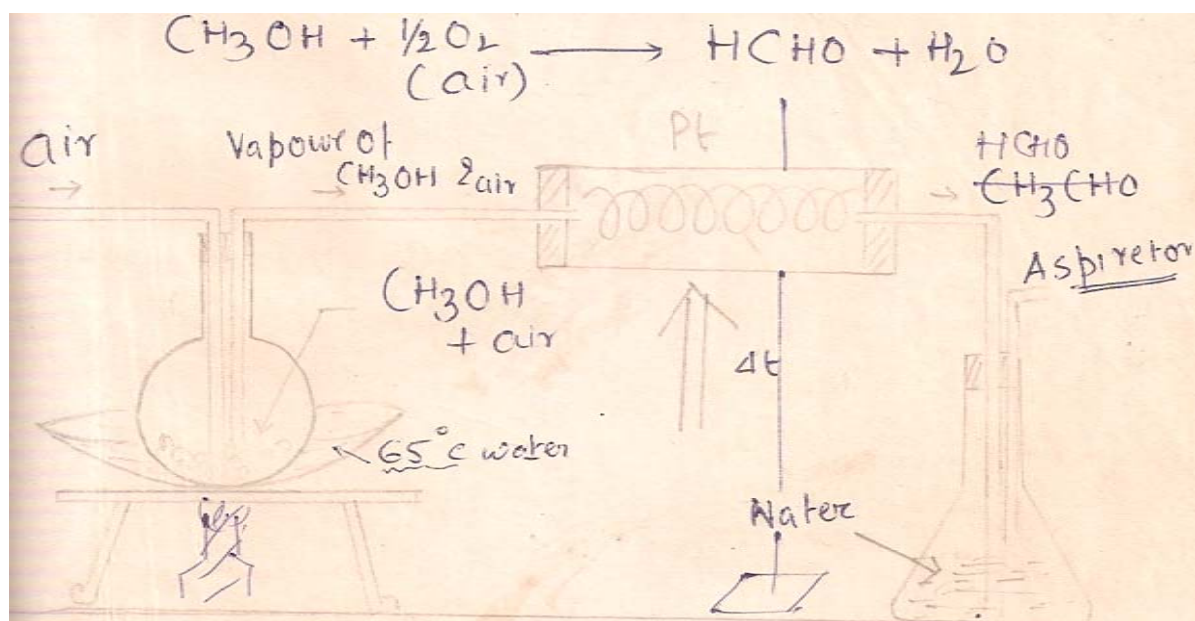
With the help of Aspiration air is sucked into the flask containing Methyl alcohol at nearly  $65^\circ\text{C}$ , which takes the  $\text{CH}_3\text{OH}$  vapour and comes to the heated platinum. Due to the above reaction we get vapour of formaldehyde which is absorbed in water as shown in the figure.

**Precaution** → Heating should not be done directly as B.P of  $\text{CH}_3\text{OH}$  is  $65^\circ\text{C}$

**Purification** → It is never prepared in pure form because at ordinary temperature three molecules of formaldehyde polymerize to form meta formaldehyde.



Meta formaldehyde

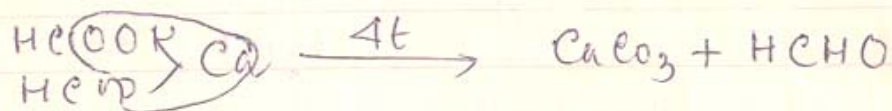






### Other Method:-

On heating calcium formate we get formaldehyde



### PHYSICAL PROPERTIES.

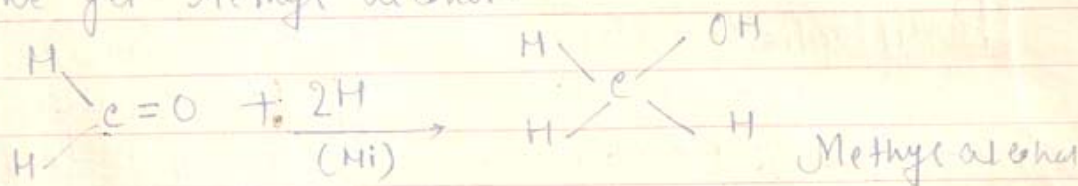
It is a colourless gas at ordinary temp<sup>r</sup>.

It has a disagreeable smell soluble in water as well as ether and alcohol.

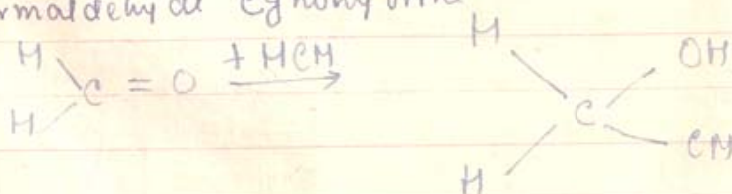
It may be converted into a liquid at  $-21^\circ\text{C}$ .

### CHEMICAL PROPERTIES

(1) With  $\text{H}_2 \rightarrow$  When formaldehyde is treated with hydrogen in presence of Ni or  $(\text{Na} + \text{C}_2\text{H}_5\text{OH})$  we get Methyl alcohol.

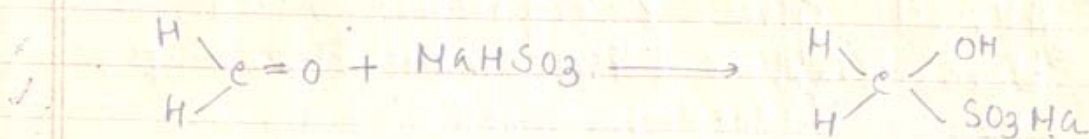


(2) With  $\text{HCN} \rightarrow$  It forms addition compound called formaldehyde cyanohydrine



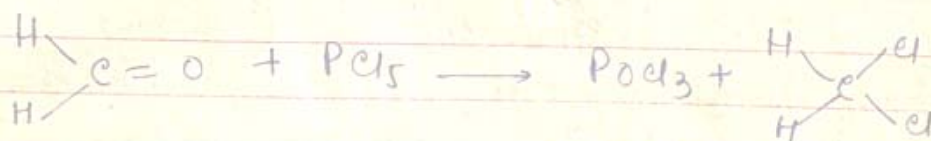


(3) With  $\text{NaHSO}_3 \rightarrow$



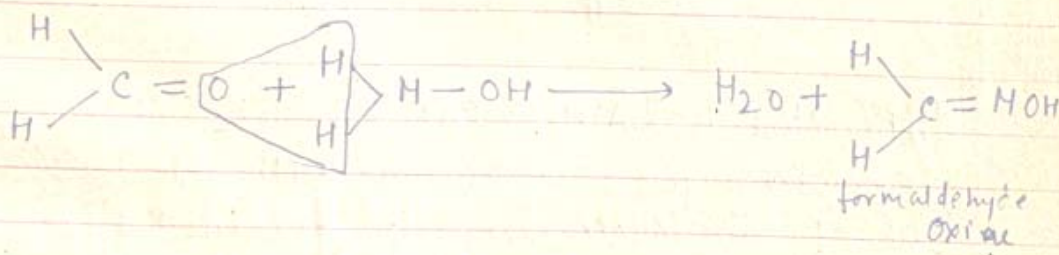
Formaldehyde Sodium Sulphite

(4) With  $\text{PCl}_5 \rightarrow$  It forms formaldehyde dichloride.

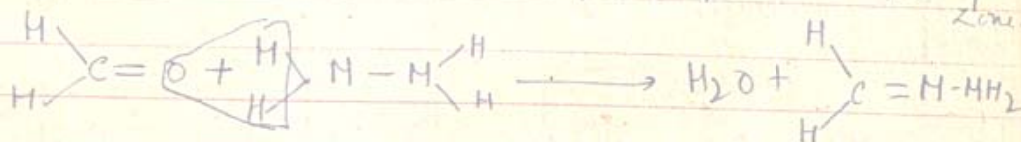


Di-chloro Methyl  
Methylene chloride

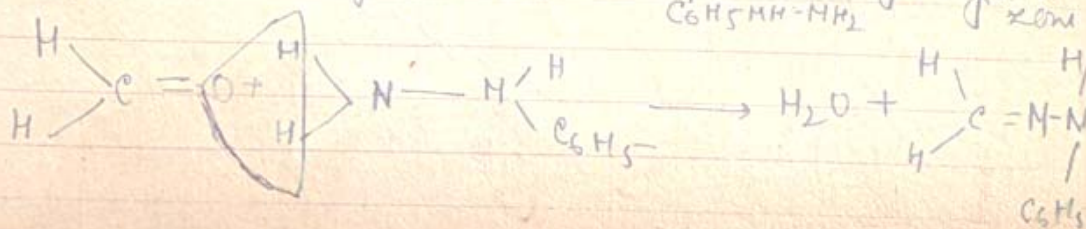
(5) With hydroxyl amine  $\rightarrow (\text{NH}_2\text{OH})$  When formaldehyde is treated with hydroxyl amine we get formaldehyde Oxime.



(6) With Hydrazine  $(\text{NH}_2\text{NH}_2) \rightarrow$  It forms formaldehyde hydrazone.



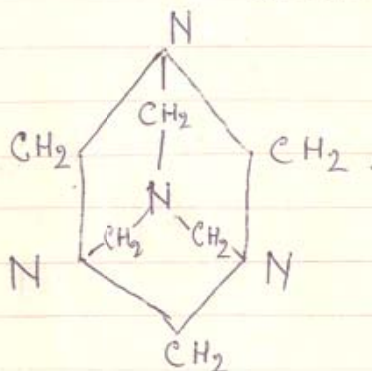
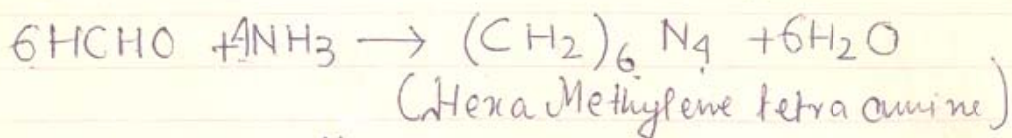
(7) With Phenyl hydrazine  $\rightarrow$  When formaldehyde is treated with Phenyl hydrazine at ordinary temperature we get formaldehyde phenyl hydrazone  $\text{C}_6\text{H}_5\text{NH}-\text{NH}_2$ .





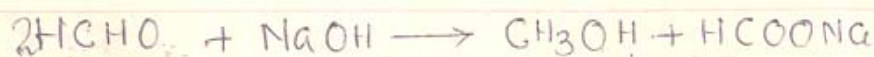


(8) With  $\text{NH}_3 \rightarrow$  When it is treated with  $\text{NH}_3$  it gives a crystalline solid called Hexa Methylene tetra amine / Urotropine which is a medicine used in gout.  $\rightarrow$

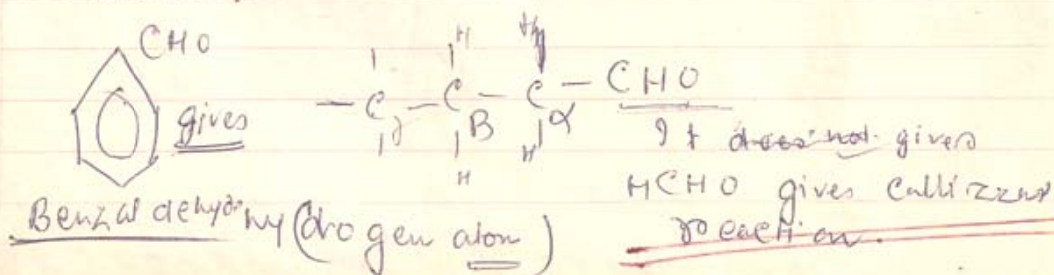


IMP  
(9)

With  $\text{NaOH}$  / CANNIZZOR'S REACTION  $\rightarrow$  When Formaldehyde is boiled with  $\text{NaOH}$  sol<sup>n</sup> ( $\text{KOH}$ ), out of two molecules of formaldehyde, one is converted into  $\text{CH}_3\text{OH}$  and the other is converted into  $\text{HCOONa}$  (via formic acid)

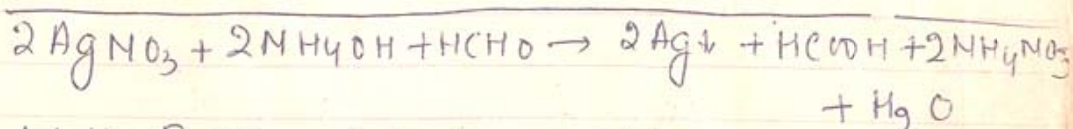
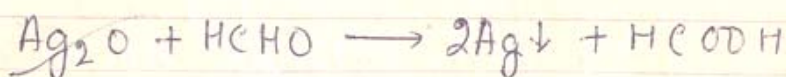


$\therefore$  NB CANNIZZOR'S reaction occurs when there will be no hydrogen atom at the  $\alpha$  carbon.



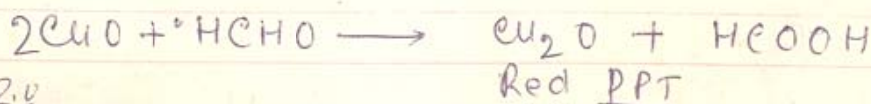
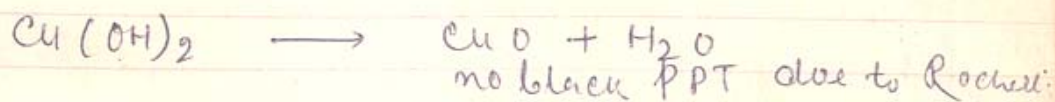
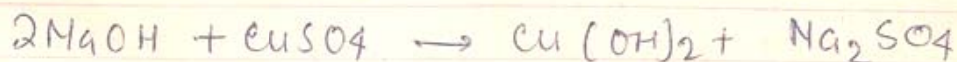


(I) With Ammonical Silver Nitrate Sol<sup>n</sup> → When formaldehyde is warmed with  $\text{AgNO}_3 + \text{NH}_4\text{OH}$  we get beautiful mirror / Silver mirror test.



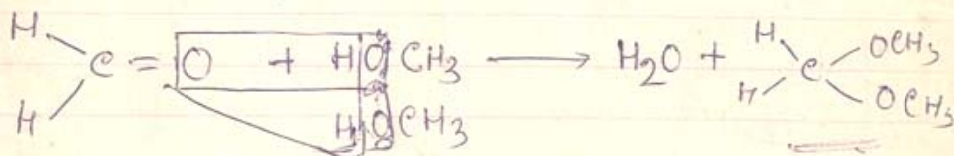
(II) With Felling Solution →  $\text{CuSO}_4$ ,  $\text{NaOH}$ , Rochelle sol<sup>n</sup>.

When formaldehyde<sup>hyde</sup> is heated with Felling Solutions we get red ppt of  $\text{Cu}_2\text{O}$



H R.V

(2) When With HCl gas and  $\text{CH}_3\text{OH}$  → When formaldehyde is treated with Methyl alcohol and HCl gas forms ~~gas~~ Methylal.





### Uses of $\text{CH}_3\text{CHO}$

- ✓ (1) As an antiseptic for nose
- (2) To prepare mirror.
- (3) To prepare artificial cloth.

Qr. In a tabular form compare (similar and dissimilar) properties of acetaldehyde and acetone

Qr. What are the two <sup>classes</sup> organic compounds which have same general formula  $\text{C}_n\text{H}_{2n}\text{O}$ . State what are the general properties and how you distinguish them.

ANS

$\text{CH}_2\text{O}$	} Formaldehyde	$\text{C}_2\text{H}_4\text{O}$	} Acetaldehyde
$\text{HCHO}$		$\text{CH}_3\text{CHO}$	
		$\text{C}_3\text{H}_6\text{O}$	} Acetone.
		$\text{CH}_3\text{COCH}_3$	