

Chapter-5

# Carboxylic Acid Derivatives

B. Sc I Year (Semester –II)

Presented by

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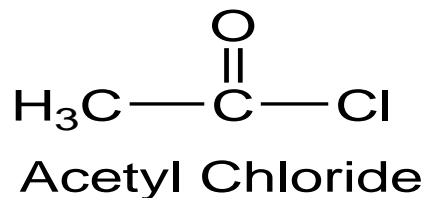
## Carboxylic acid derivatives

- These are the derivatives of Carboxylic acid, obtained by replacing  $-OH$  group of carboxylic acid by  $-Cl$ ,  $-OCOR$ ,  $-OR$ ,  $-NH_2$

- A) Acid Chlorides :

- These are the derivatives of carboxylic acid obtained by replacing by  $-OH$  group of carboxylic acid by  $-Cl$  atom is called as acid chlorides.

Ex.

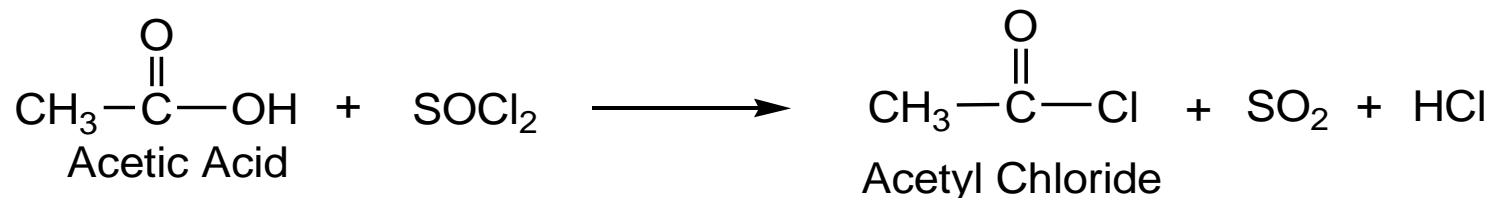


## A) Acid Chloride (Acetyl Chloride)

### Preparation Methods :

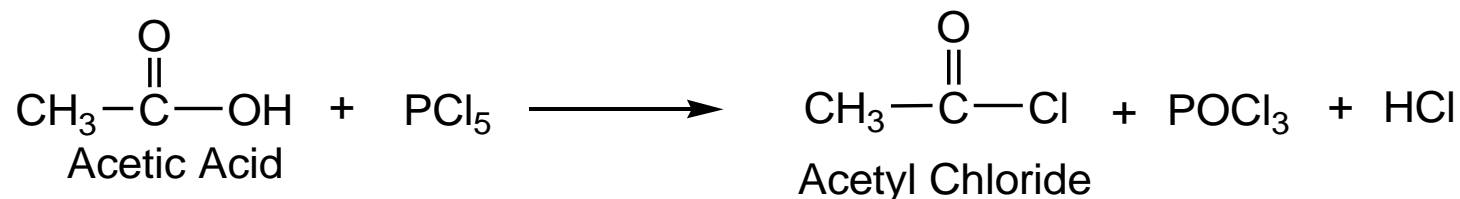
- 1) From Acetic acid & Thionyl chloride ( $\text{SOCl}_2$ ) :

- Acetic acid react with  $\text{SOCl}_2$  to give acetyl chloride.



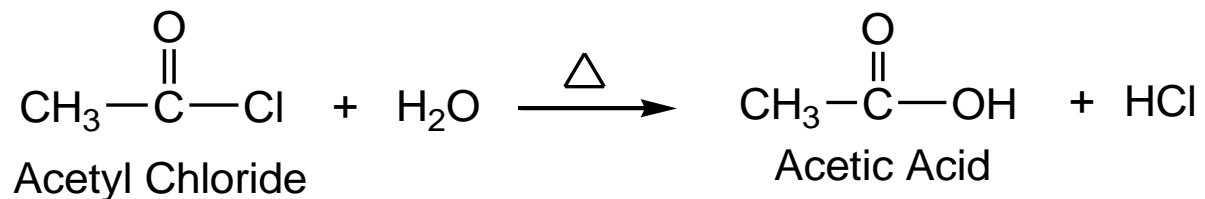
- 2) From Acetic acid & phosphorus pentachloride ( $\text{PCl}_5$ ) :

- Acetic acid react with  $\text{PCl}_5$  to give acetyl chloride.

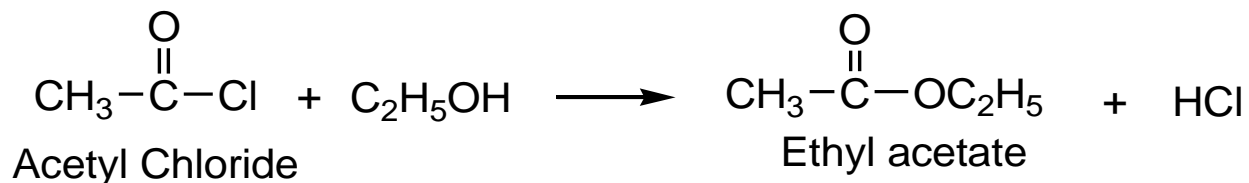


## Chemical reactions of Acetic acid

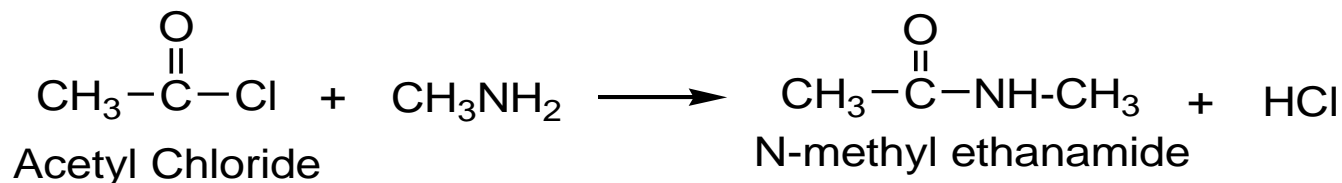
- 1) **Hydrolysis** : Acetyl chloride on hydrolysis gives acetic acid.



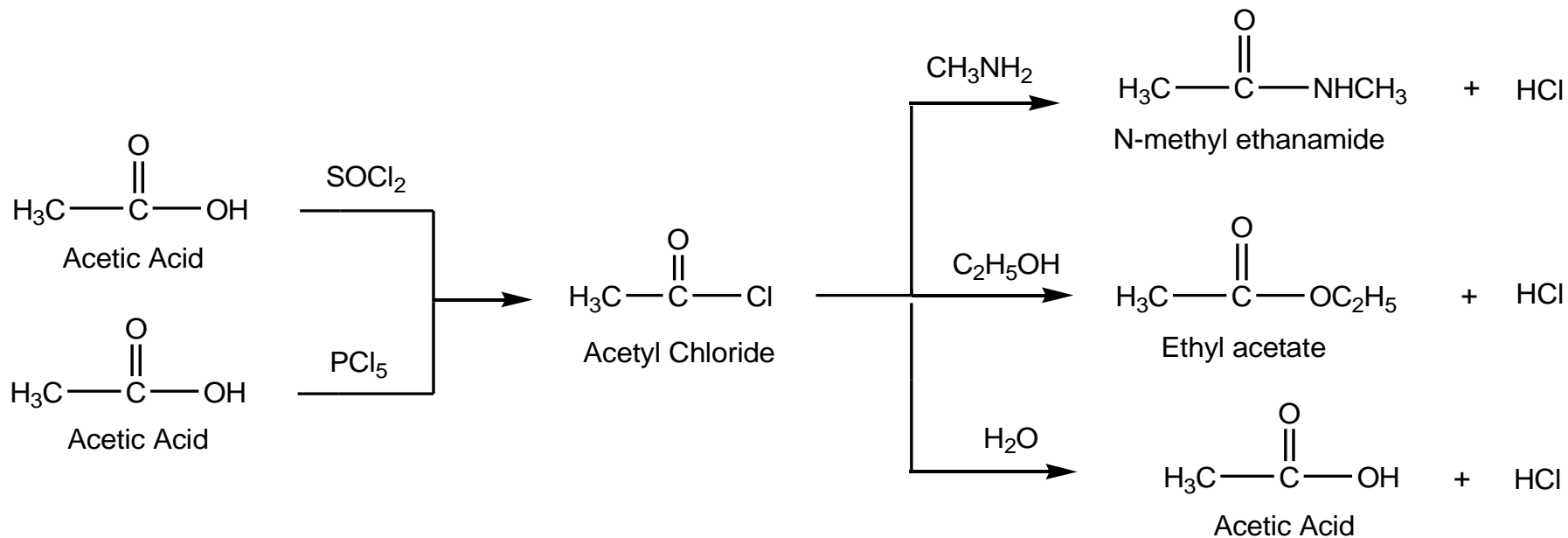
- 2) **Action of alcohol** : Acetyl chloride on reaction with ethanol gives ethyl acetate.



- 3) **Action of amines** : Acetyl chloride react with methyl amine to give N-methyl ethanamide.



# Preparation & Chemical reactions of Acetic acid

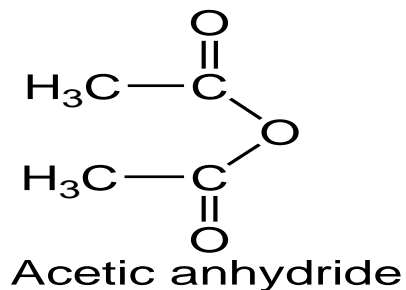


## B) Acid anhydride (Acetic anhydride)

- These are the derivatives of carboxylic acid obtained by replacing by -OH group of carboxylic acid by -OCOR group is called as acid anhydride.

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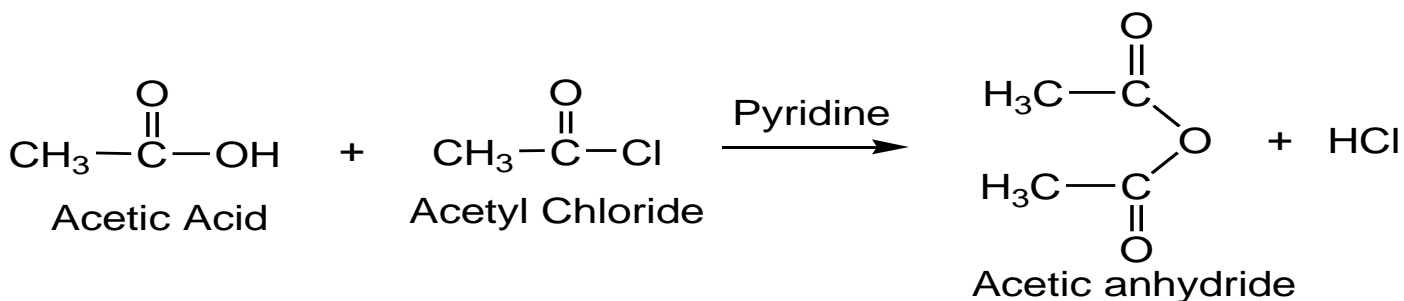
Ex.



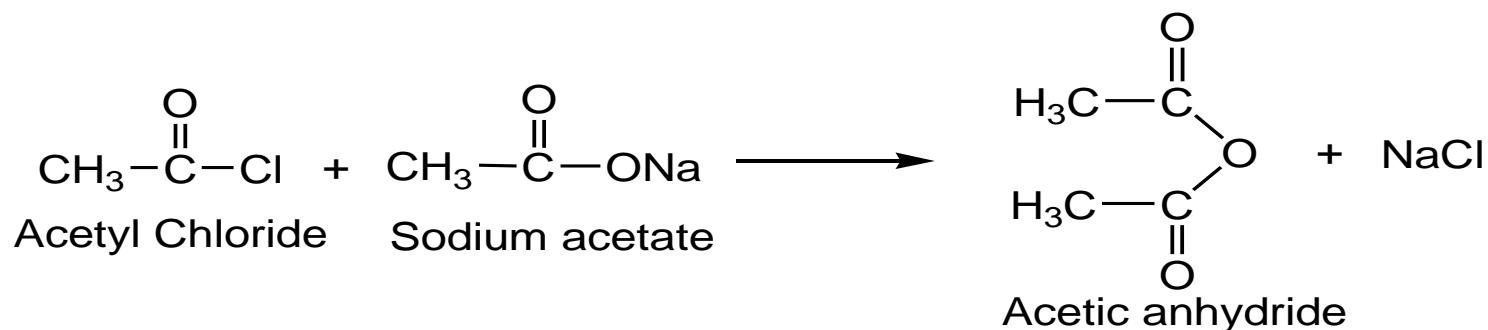
# Acid anhydride (Acetic anhydride)

## Preparation Methods :

- 1) **From acetyl chloride and acetic acid** : Acetyl chloride react with acetic acid in presence of pyridine gives acetic anhydride.

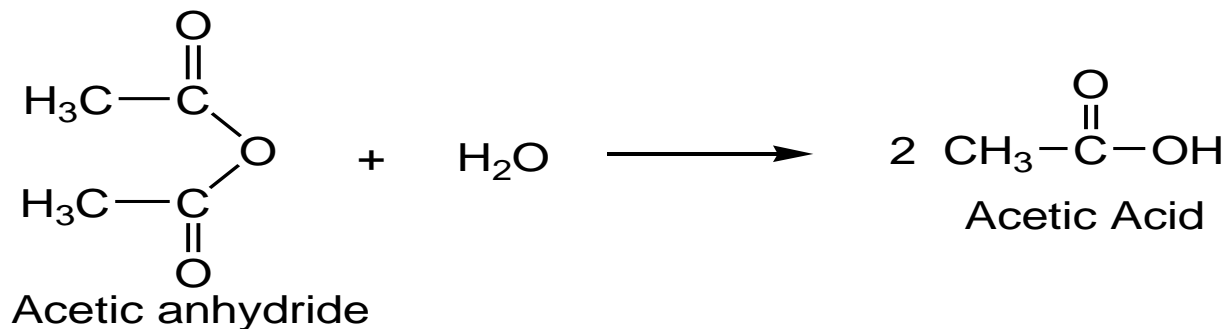


- 2) **From acetyl chloride and sodium acetate** : Acetyl chloride react with sodium acetate gives acetic anhydride.

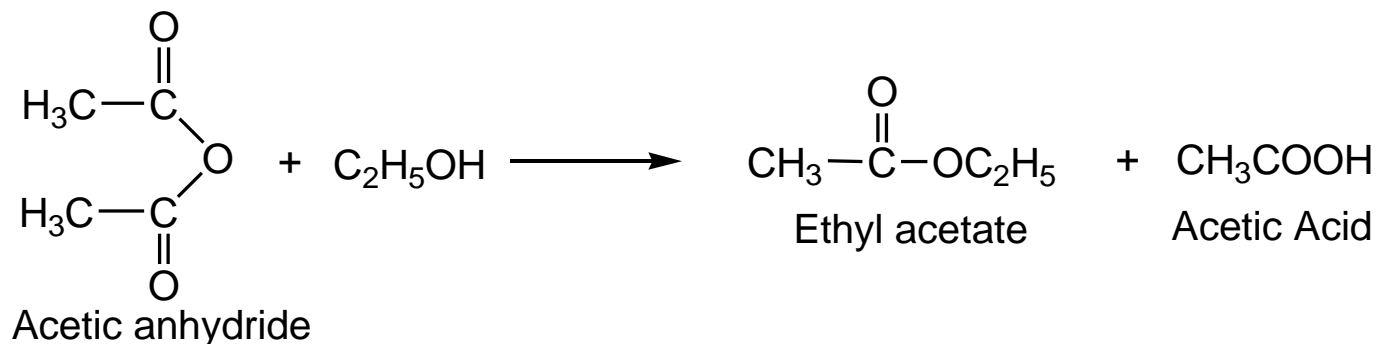


## Chemical reactions of Acetic anhydride

- 1) **Hydrolysis** : Acetic anhydride on hydrolysis gives acetic acid.



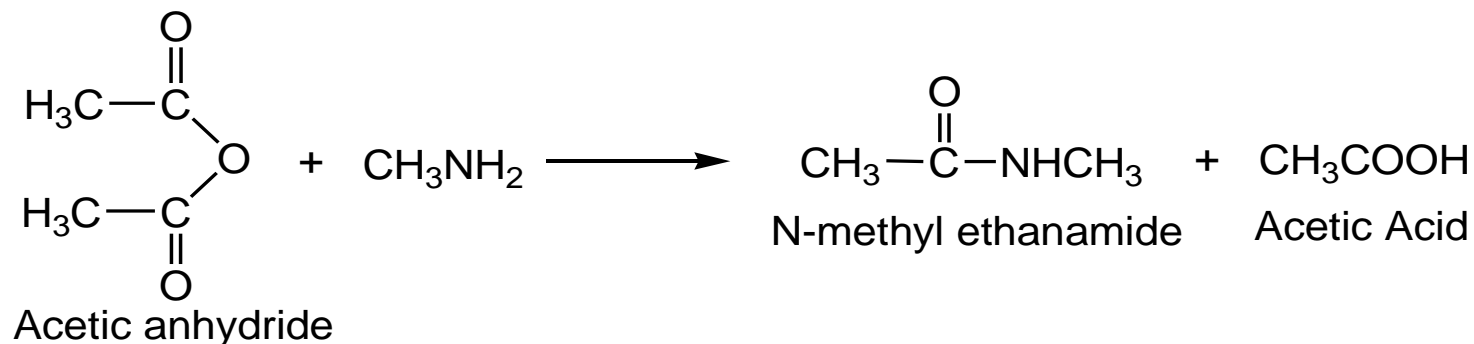
- 2) **Action with ethyl alcohol** : Acetic anhydride react with ethyl alcohol gives mixture of ethyl acetate and acetic acid.



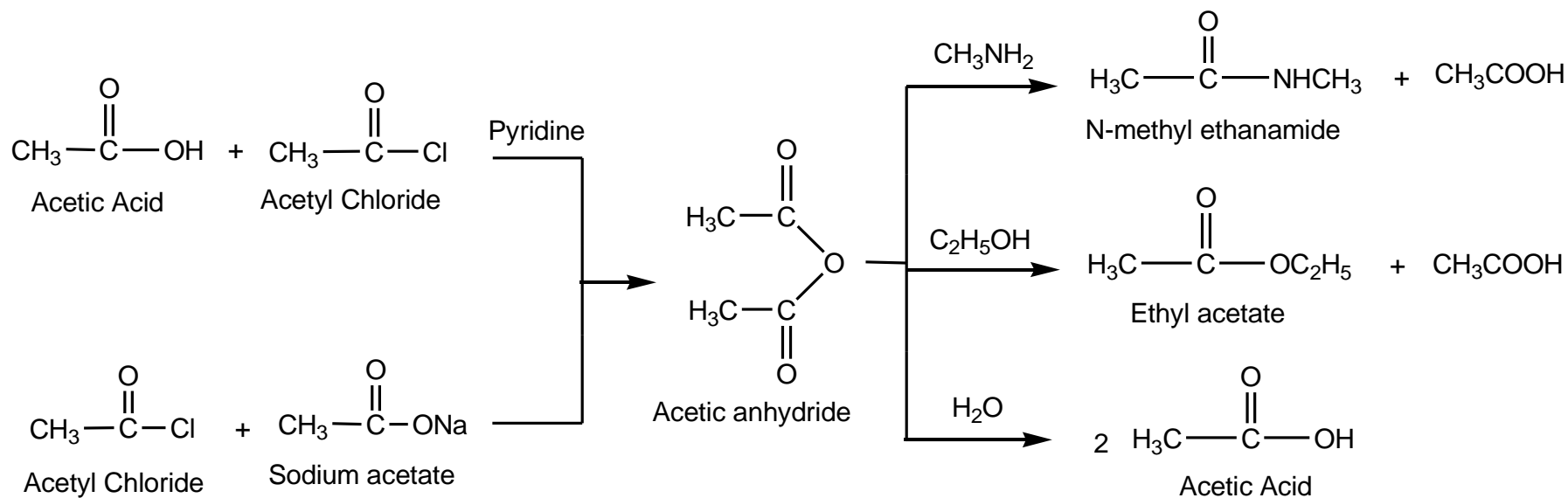


## Chemical reactions of Acetic anhydride

- 3) **Action with amines** : Acetic anhydride react with methyl amine gives mixture of N-methyl ethanamide and acetic acid.



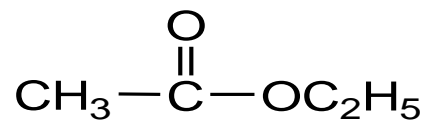
# Preparation & Chemical reactions of Acetic anhydride



## c) Esters (Ethyl acetate)

- These are the derivatives of carboxylic acid obtained by replacing by -OH group of carboxylic acid by -OR group is called as esters.

Ex.

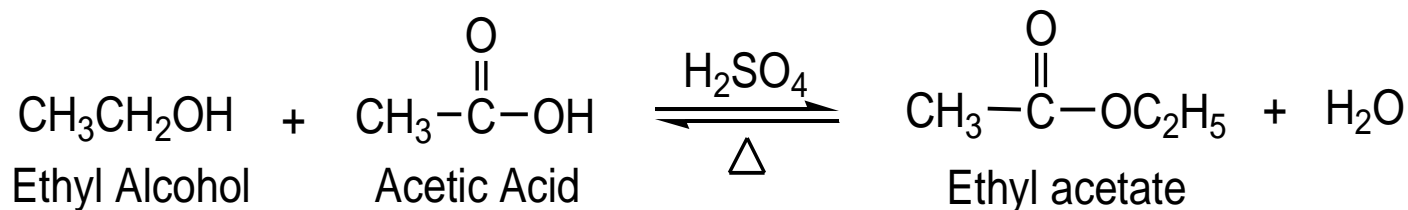


Ethyl acetate

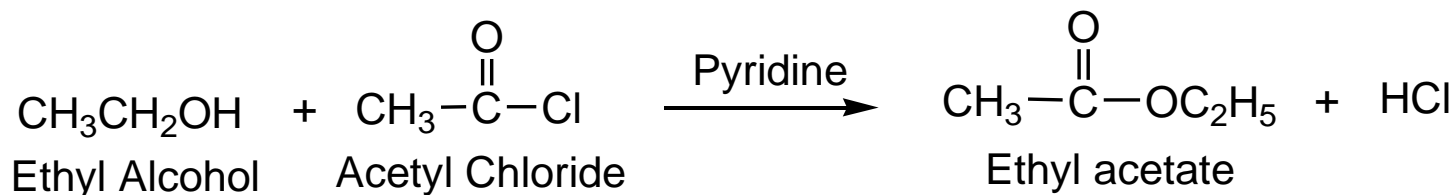
## Esters (Ethyl acetate)

### Preparation Methods :

- 1) From ethyl alcohol and acetic acid :
- Ethyl alcohol on heated with acetic acid in presence of  $\text{H}_2\text{SO}_4$  undergo dehydration to give ethyl acetate.

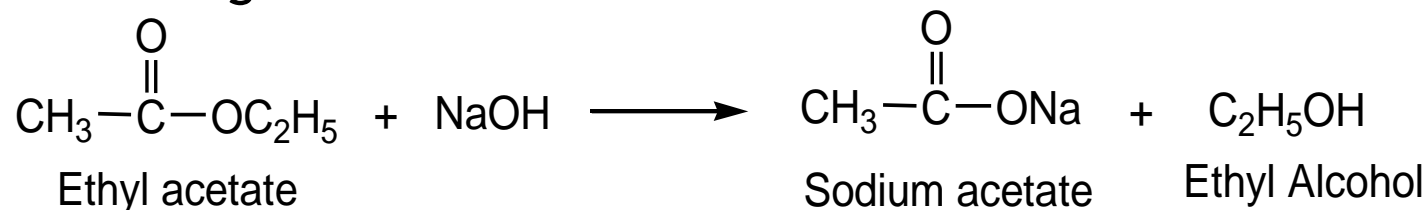


- 2) From ethyl alcohol and acetyl chloride :
- Ethyl alcohol react with acetyl chloride in presence of pyridine to give ethyl acetate.

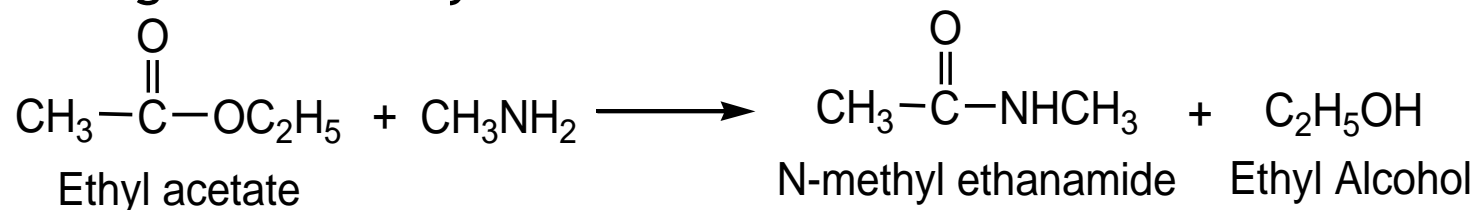


## Chemical reactions of Ethyl acetate

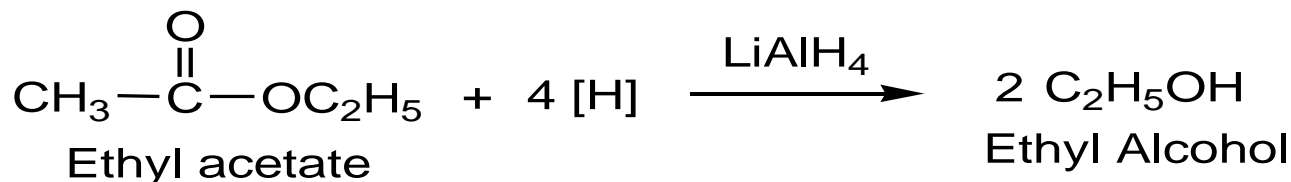
- **1) Alkaline hydrolysis :** Ethyl acetate on alkaline hydrolysis with NaOH gives sodium acetate.



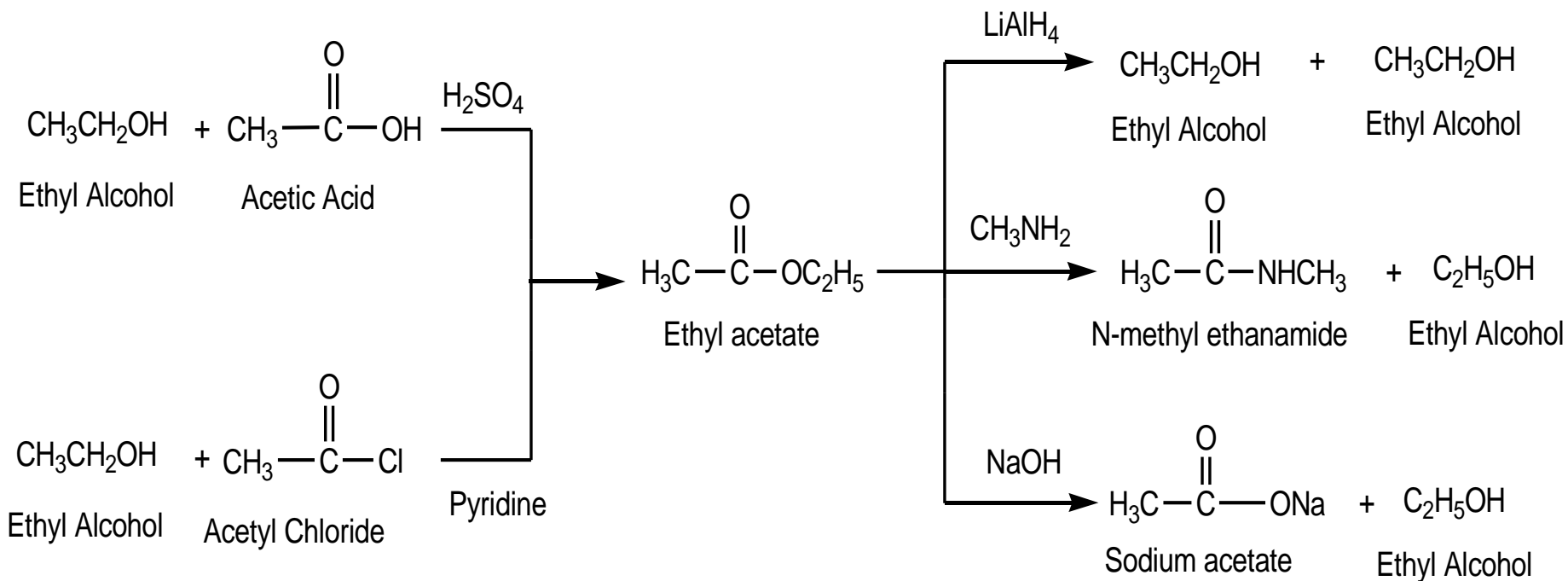
- **2) Action of amines :** Ethyl acetate on reaction with methyl amine gives N-methyl ethanamide.



- **3) Reduction :** Ethyl acetate on reduction with  $\text{LiAlH}_4$  gives ethyl alcohol.



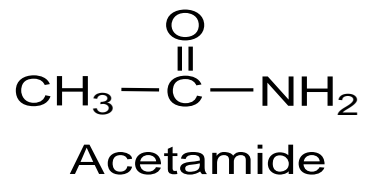
# Preparation & Chemical reactions of Ethyl acetate



## D) Amides (Acetamide)

- These are the derivatives of carboxylic acid obtained by replacing by -OH group of carboxylic acid by -NH<sub>2</sub> group is called as amides.

Ex.

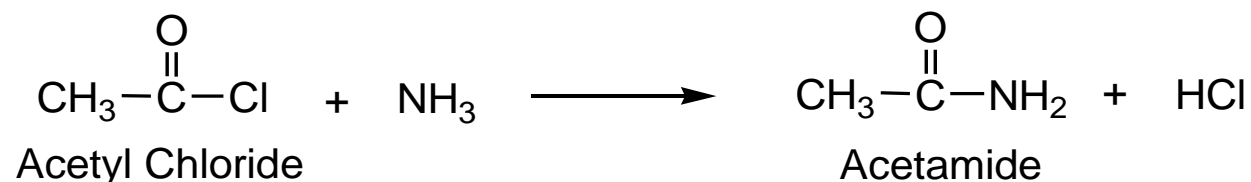


# Amides (Acetamide)

## Preparation Methods :

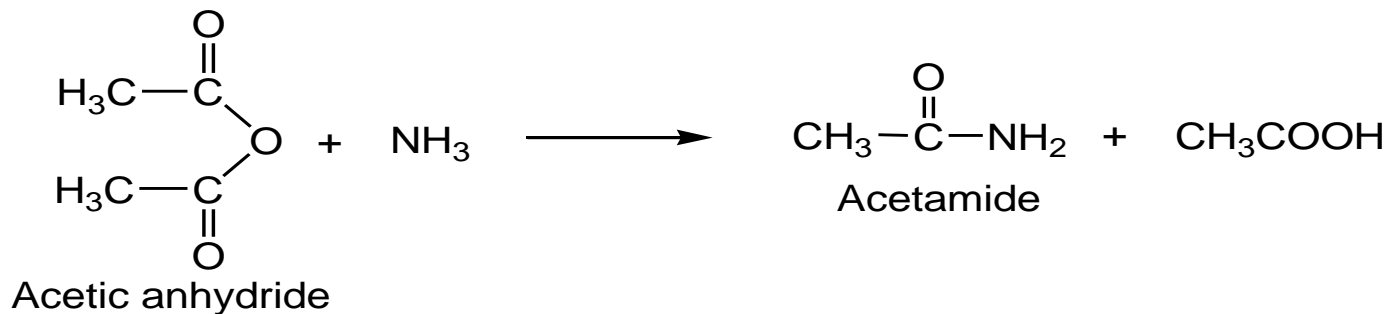
◉ 1) By the action of Ammonia on Acetyl chloride :

◉ Acetyl chloride react with  $\text{NH}_3$  gives acetamide.



◉ 2) By the action of Ammonia on Acetic anhydride :

◉ Acetic anhydride react with  $\text{NH}_3$  gives acetamide.

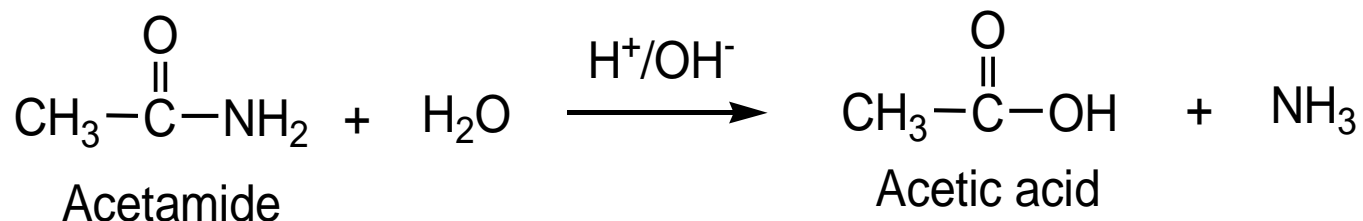




## Chemical reactions of Acetamide

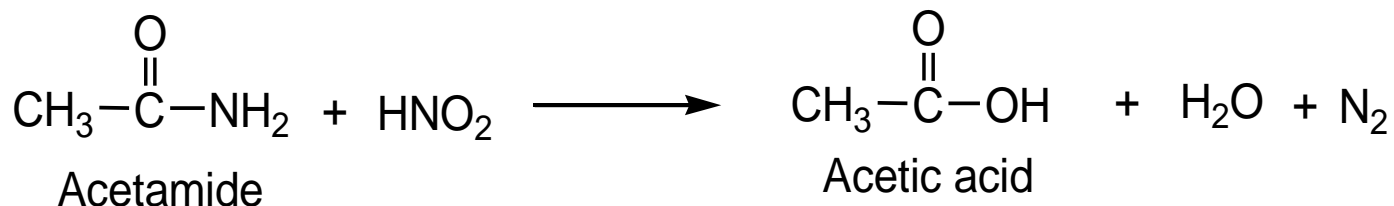
### 1) Hydrolysis :

- Acetamide on hydrolysis with  $H^+$  or  $OH^-$  gives acetic acid.

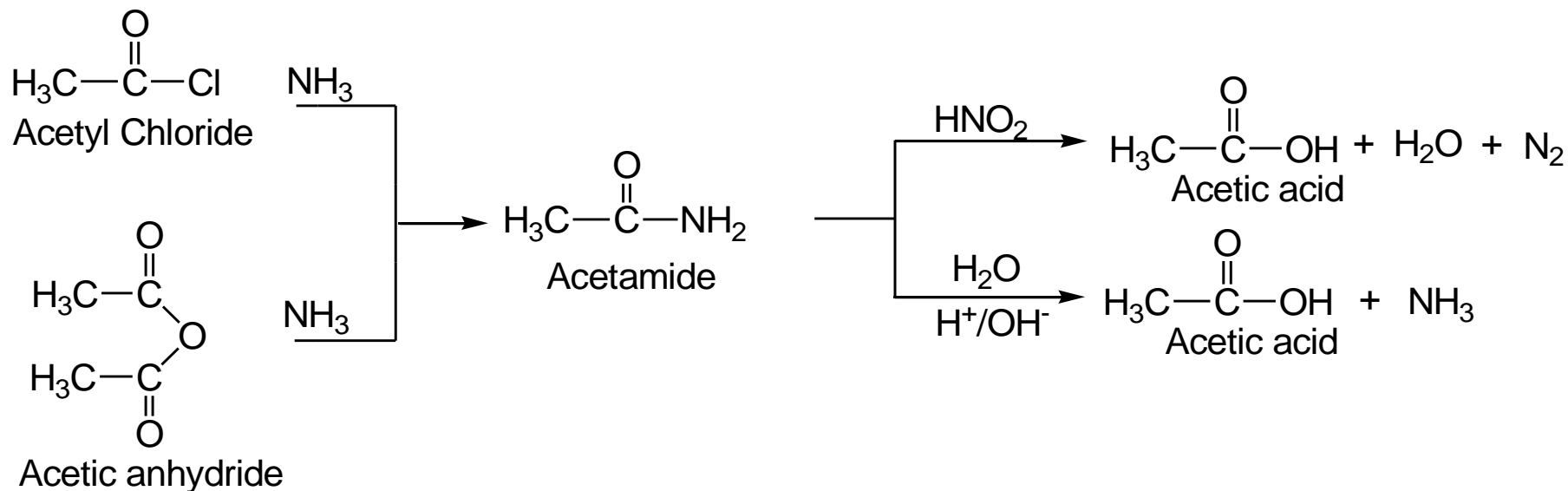


### 2) Action of nitrous acid ( $\text{HNO}_2$ ) :

- Acetamide react with  $\text{HNO}_2$  gives acetic acid.



# Preparation & Chemical reactions of Acetamide



- Thank you .....