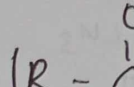
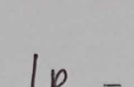
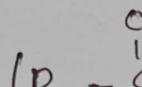
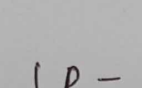
ALDEHYDES, KETONES, CARBOXYLIC ACID.

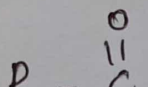
 - Carbonyl

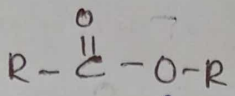
 - Aldehyde

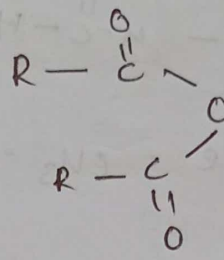
 - Ketone

 - Carboxylic Acid.

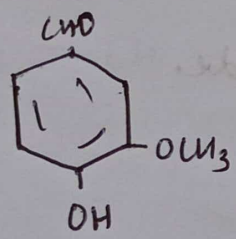
 - Acyl chloride

 - Amide.

 - Ether.

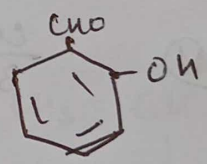
 - Acid Anhydride.

Vanilla Beans.



Vanillin

Meadow Seeds



Salicaldehyde

Cinnamon.

Cinnamaldehyde

Common Name

form - 1C

Acet - 2C

formaldehyde - $H-\overset{O}{\overset{\|}{C}}-H$

Acet aldehyde - CH_3-CHO.

Acetone $CH_3-\overset{O}{\overset{\|}{C}}-CH_3$

Benzaldehyde - 

Acetophenone - $O=C-CH_3$ 

α, β, γ

$CH_3-\underset{\underset{Br}{|}}{CH}-CH_2-CHO$

β - Bromo aldehyde.

MOP ~

① From Alcohal.

CH_3-CH_2-OH $\xrightarrow[300\ atm]{Cu/573K}$ CH_3-CHO.

1° Alc

Ethanol.

Ethanal Aldehyde.

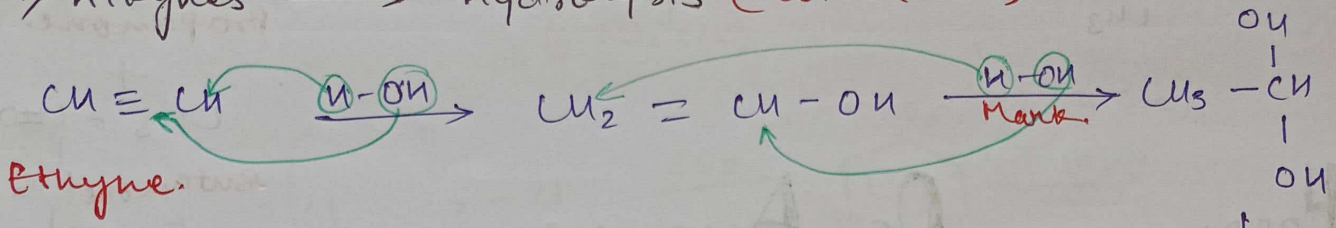
$CH_3-\underset{\underset{OH}{|}}{CH}-CH_3$ $\xrightarrow[300\ atm.]{Cu\ 573K}$ $CH_3-\overset{O}{\overset{\|}{C}}-CH_3$

Propan-2-ol

Propanone.

② From Hydrocarbons.

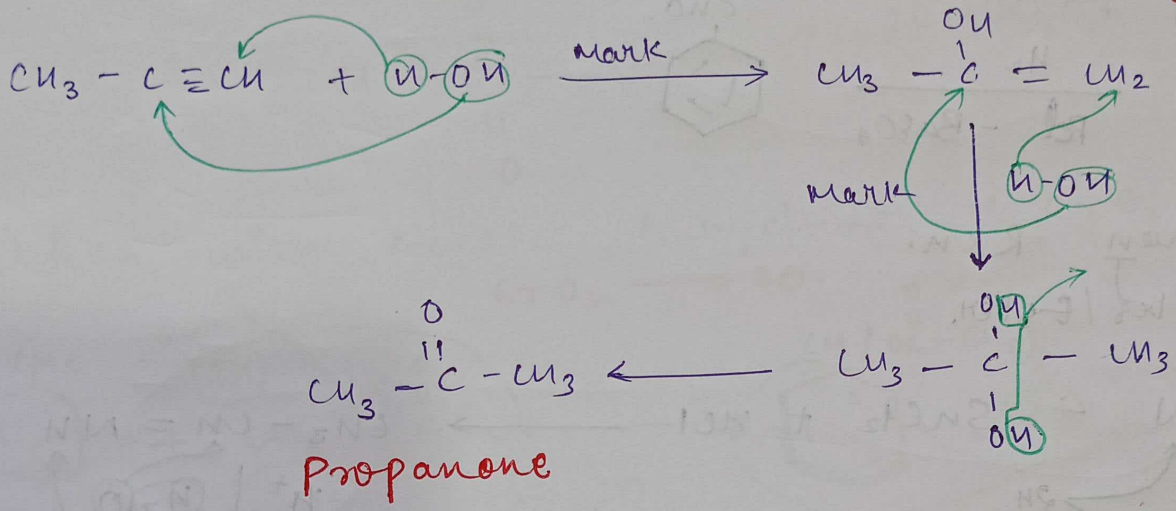
a) 1) Alkynes ⟶ Hydrolysis (addition Rxn)



Ethyne.

$CH_3 - CHO$.
Ethanal.

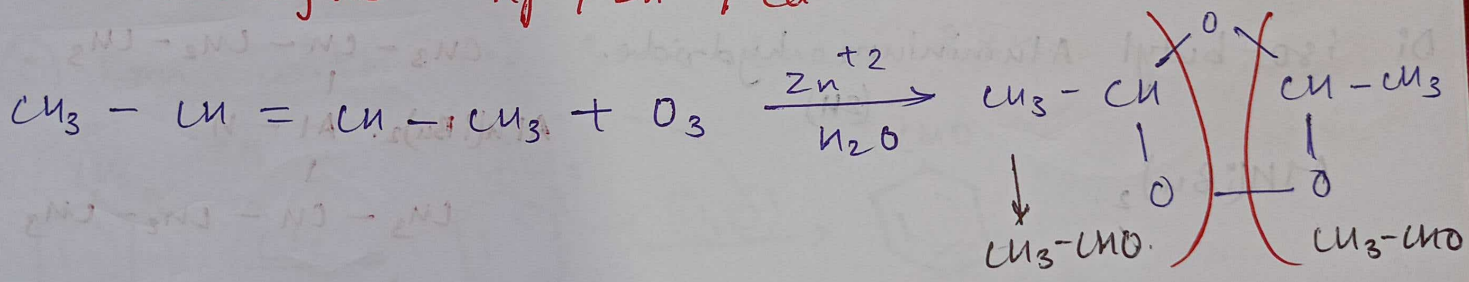
a) 2) Alkynes



Propanone

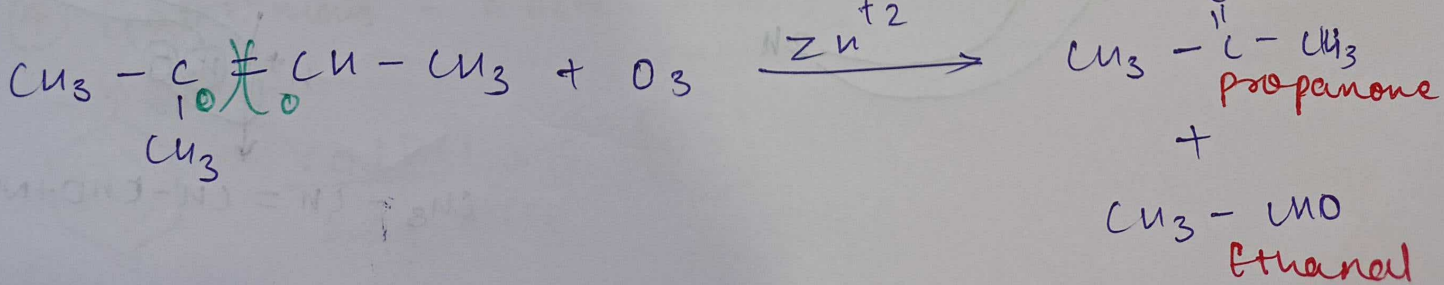
b) From Alkene.

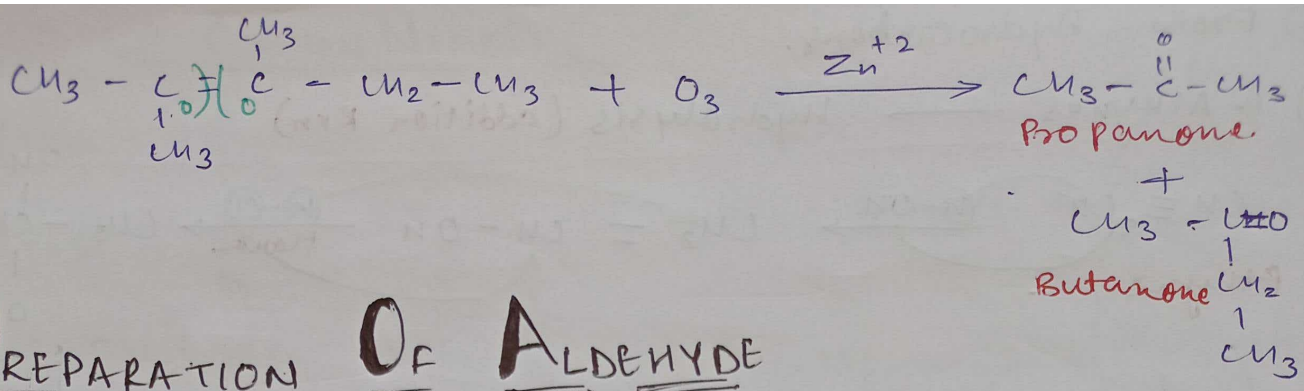
Ozonlysis – Hg^{+2} / Zn^{+2} / Cd^{+2}.



ethanal

Example:

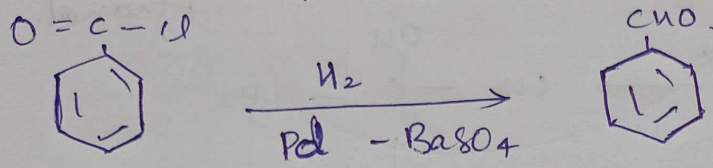




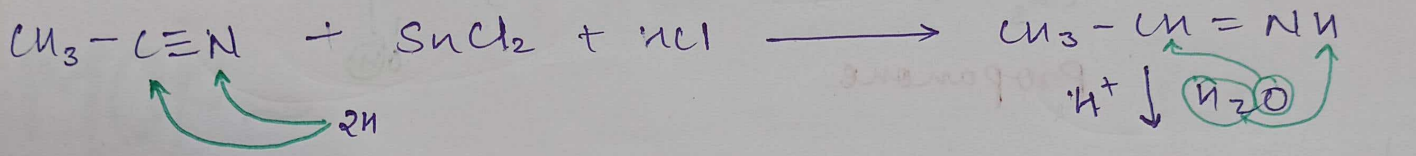
PREPARATION OF ALDEHYDE

25★

① Rosenmund Reduction.



② Stienphen Rxn.
[Nitriles / Ester.



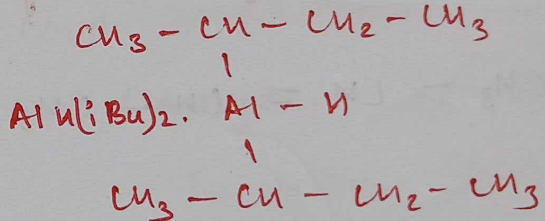
$CH_3-CHO + NH_3$

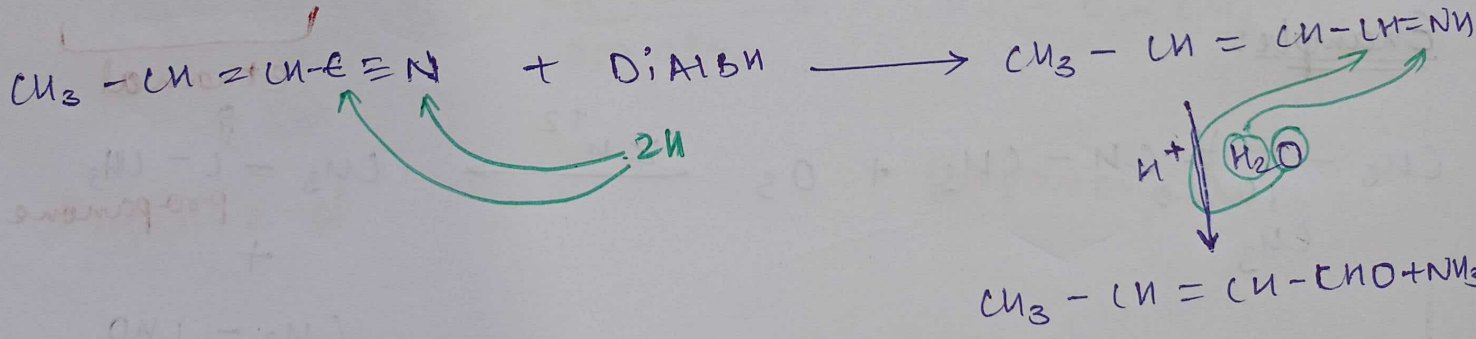
* Substitution.

DiBAlH

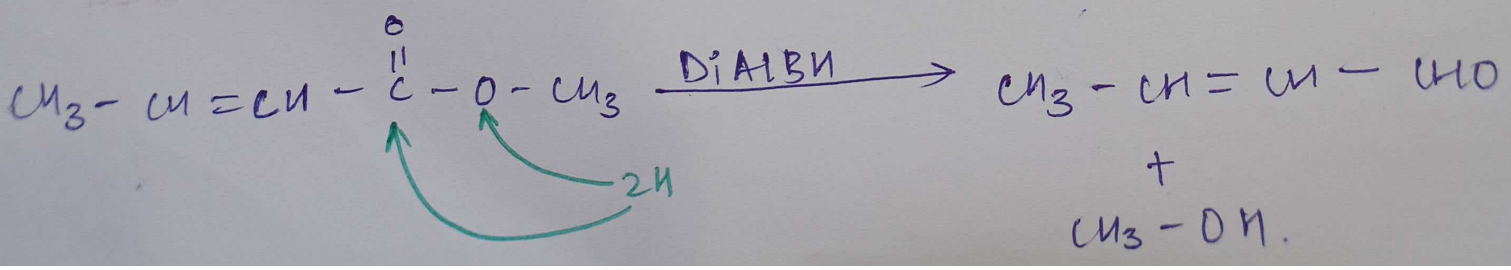
Di iso-butyl Aluminium hydride. (2H)

$AlH(iBu)_2$.





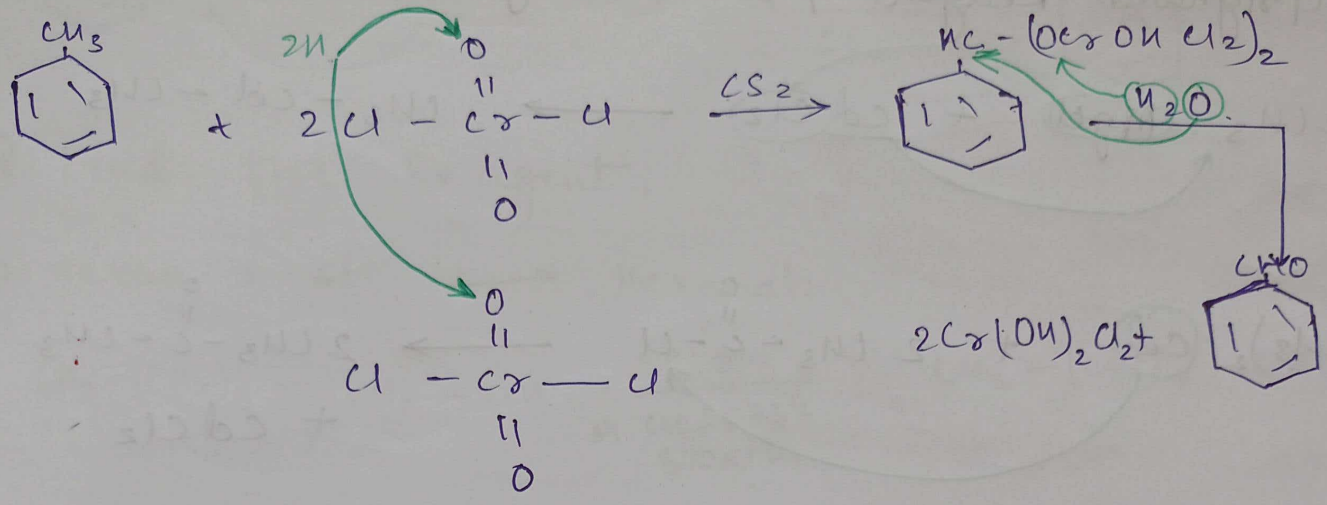
$CH_3-CH=CH-CHO+NH_3$



$CH_3-CH=CH-CHO$ + CH_3-OH.

③ Methyl Benzene.

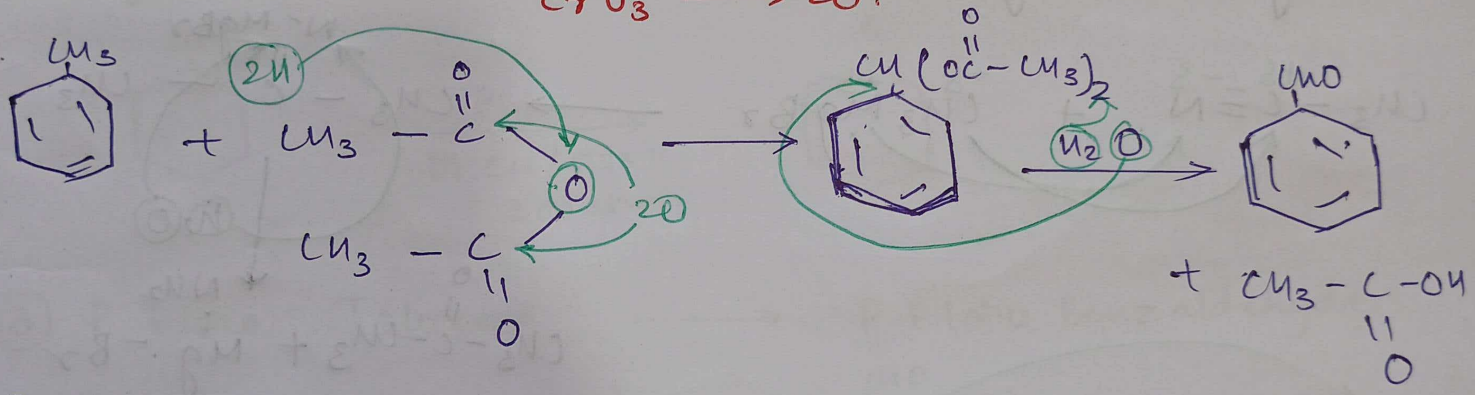
~~2°~~ Etard Rxn. ⟶ Chromyl Chloride. (CrO_2Cl_2)



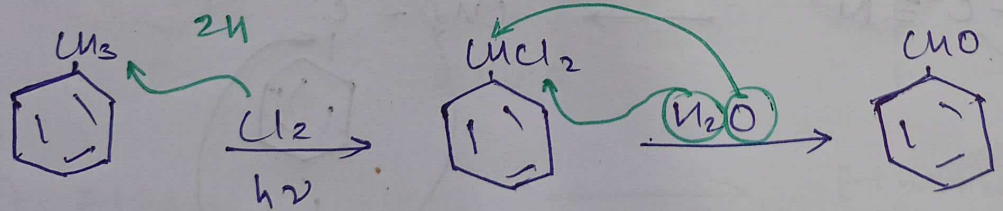
$2Cr(OH)_2Cl_2 +$

b) Rxn with Acetic Anhydride & CrO_3

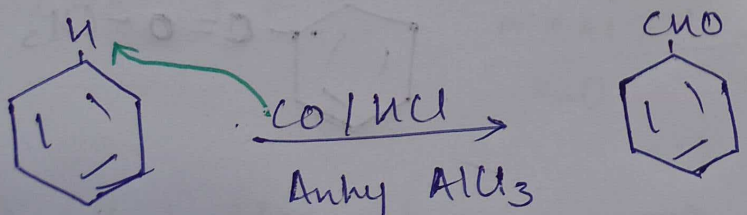
$CrO_3 \longrightarrow 2O.$



ⓒ Rxn with Cl_2 Side Chain Rxn.

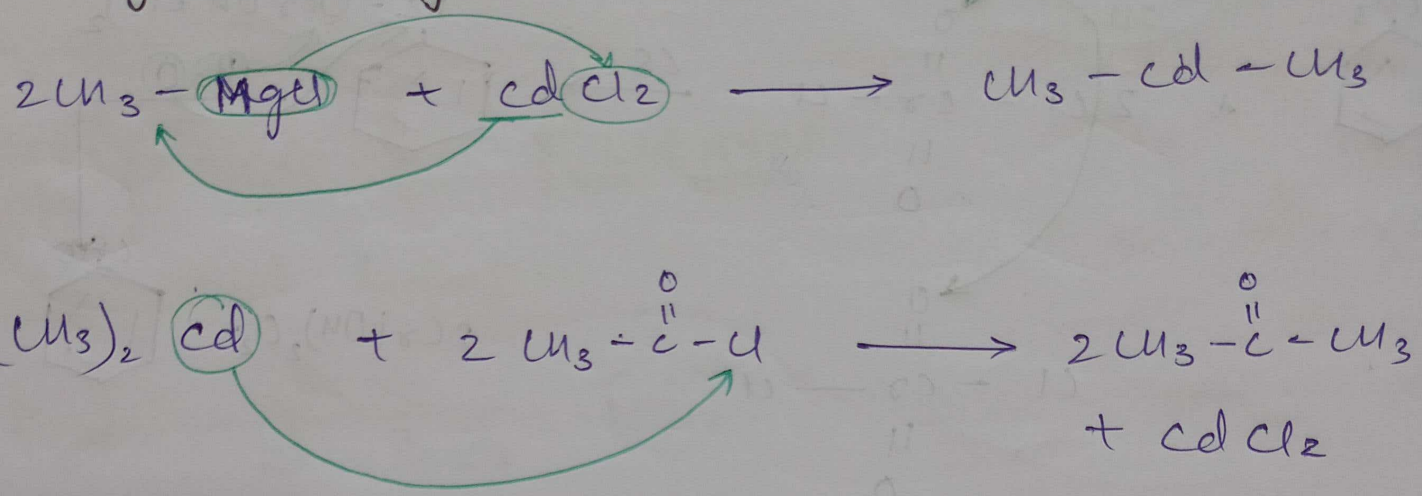


④ Gatterman – Koch Rxn.

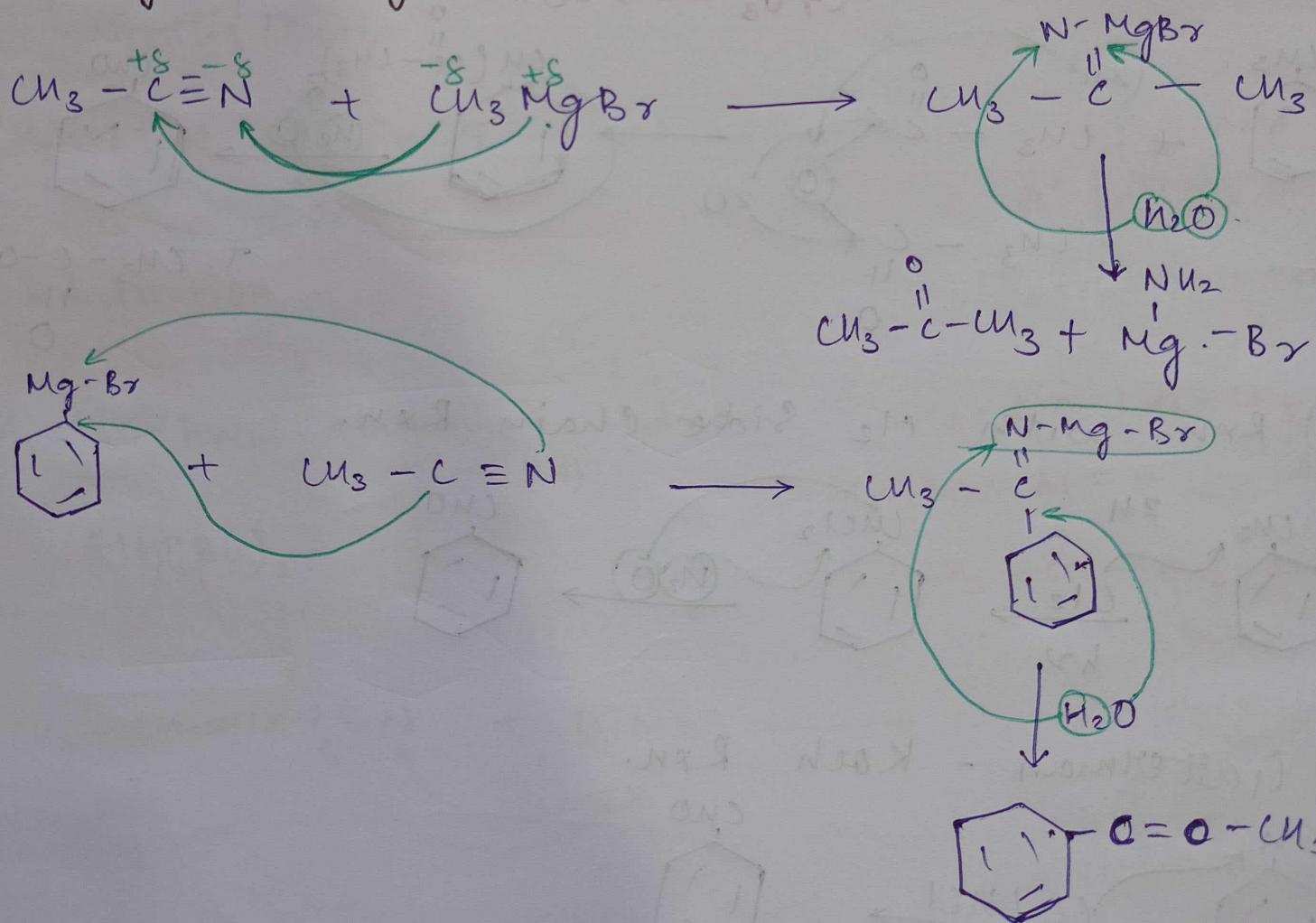


Preparation Of Only Ketone

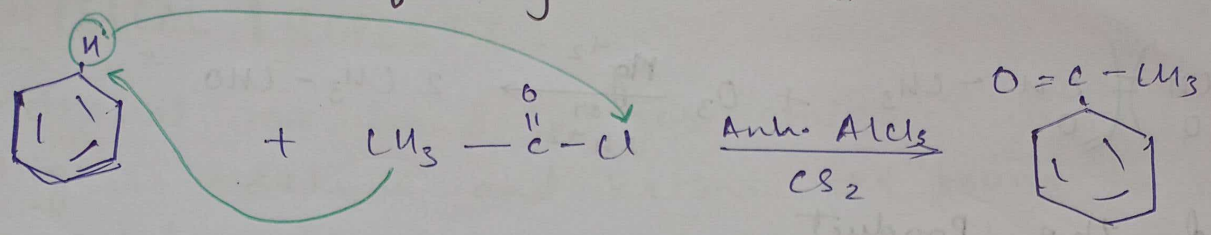
① Grignard Reagent / $CdCl_2$ / Acyl chloride.



② Grignard Reagent / Nitriles ($-C\equiv N$)



⑧ Friedel Craft Acylation Rxn.

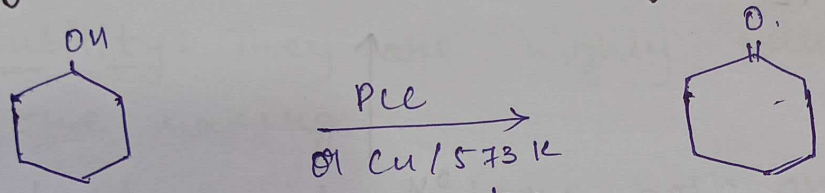


Q. Find the Reagent.

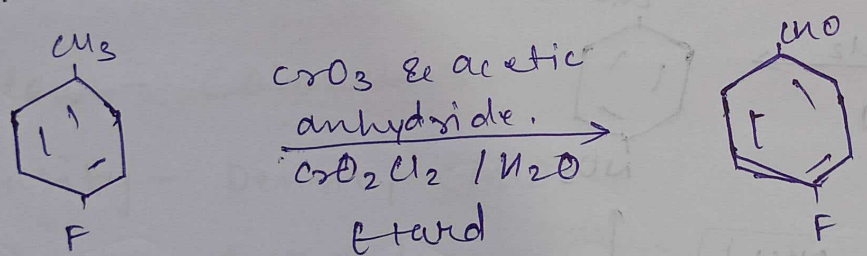
① Hexan-1-ol ⟶ Hexanal.

$CH_3-(CH_2)_4-CH_2-OH \xrightarrow[\text{or } Cu/573K \text{ 300 atm}]{PCC} CH_3-(CH_2)_4-CHO.$

② Cyclohexanol ⟶ Cyclohexanone.



③ P Floro Toluene ⟶ P Floro Benzaldehyde.



④ Ethan nitrile ⟶ Ethanal

$CH_3-C\equiv N \xrightarrow[\text{DiBAl / H}]{Sn Cl_2 / HCl} \xrightarrow[H_2O]{} CH_3-CHO.$

⑤ Allyl Alcohol ⟶ Propenal.

$CH_2=CH-CH_2-OH \xrightarrow{PCC} CH_2=CH-CHO$

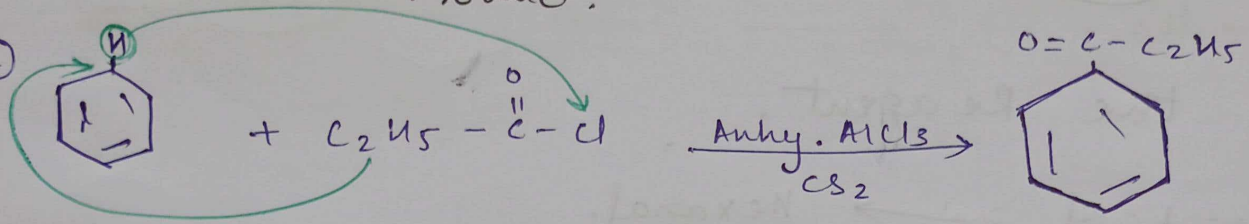
(6) But-2-ene ⟶ Ethanal.

$CH_3-CH=CH-CH_3 + O_3 \xrightarrow[OH]{Hg^{+2}} 2\,CH_3-CHO.$

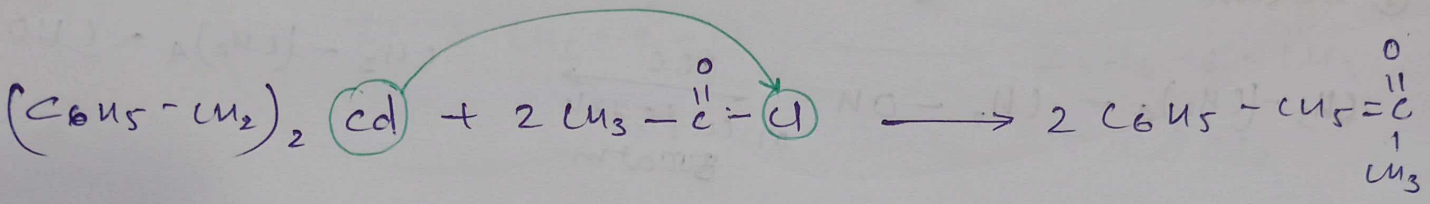
$2H^{+2}$

Q. Find the Product.

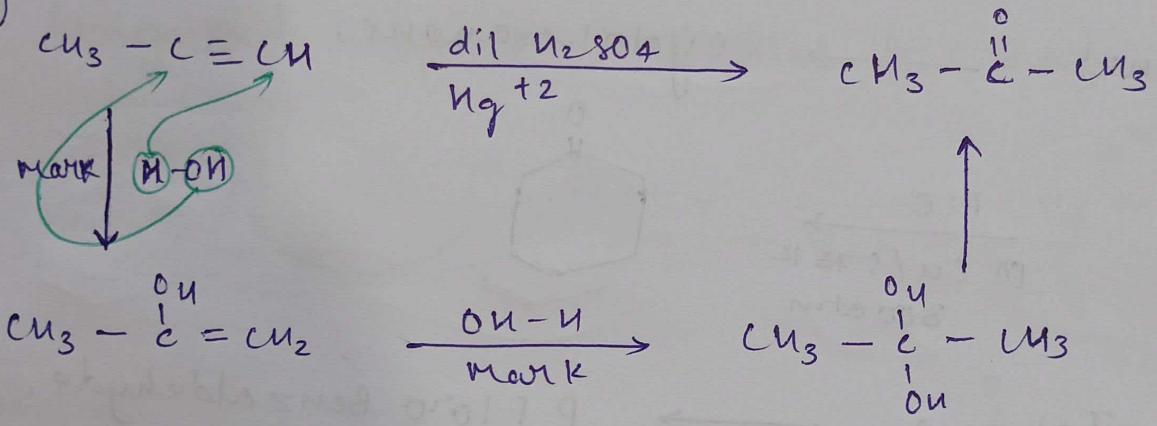
(1)



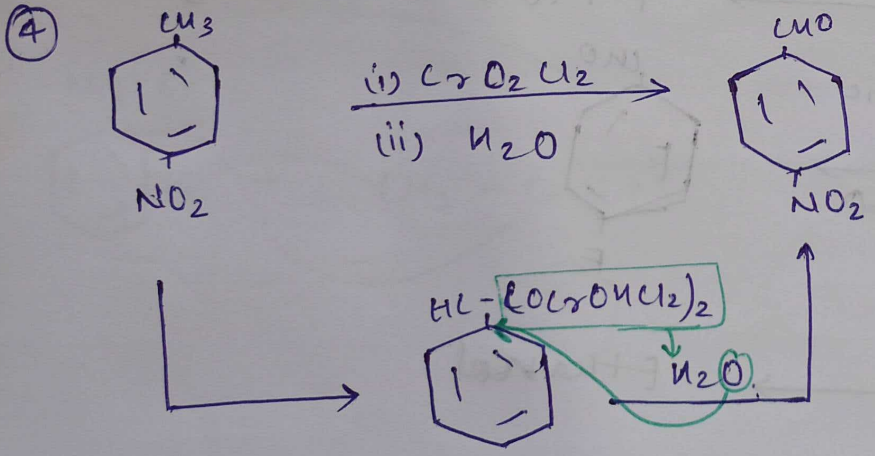
(2)



(3)



(4)



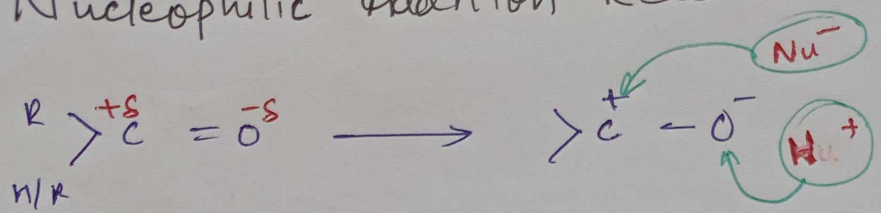
PHYSICAL PROPERTY:

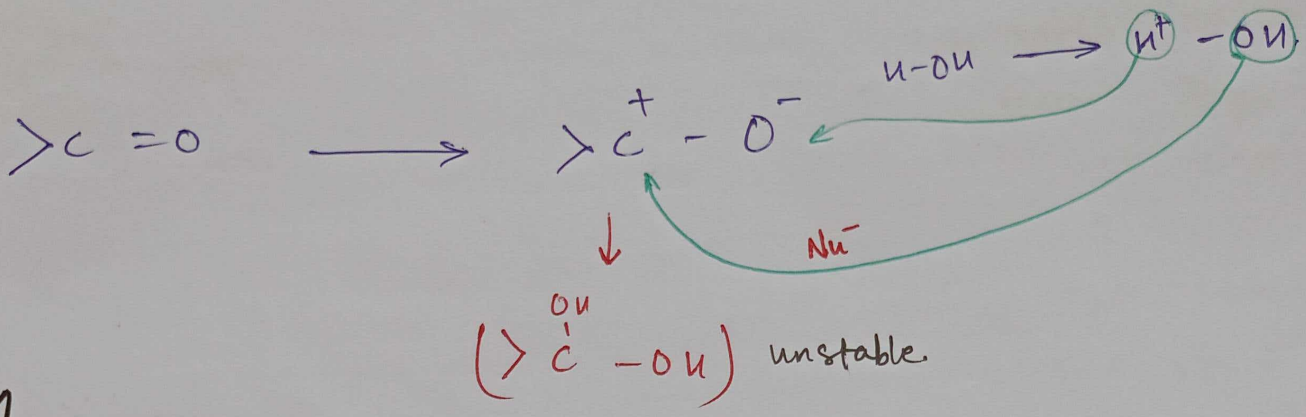
- Methanal are found in gas state.
- Higher Aldehyde and ketone are found in liquid or solid state.
- Lower Aldehyde have a pungent smell but higher Aldehyde have a specific frangnance of sweet smell.
- They are bitter in taste.
- Their Boiling point and Melting point are higher than Hydrocarbons but lower than Alcohol.
- Their M.P & B.P are also higher than Ether.
- Solubility: They are highly soluble in water; due to the making
- Aldehyde and ketone both are soluble in non-polar solvent also. Solubility increase when no. of carbon increase (Non-polar)
- Colour - Colourless
- Density - Density $\propto$ Mw
- M.P / B.P $\propto$ Mw $\propto \frac{1}{\text{Branching}}$.

Alc > Ketone > Aldehyde > Ether > Alkene.

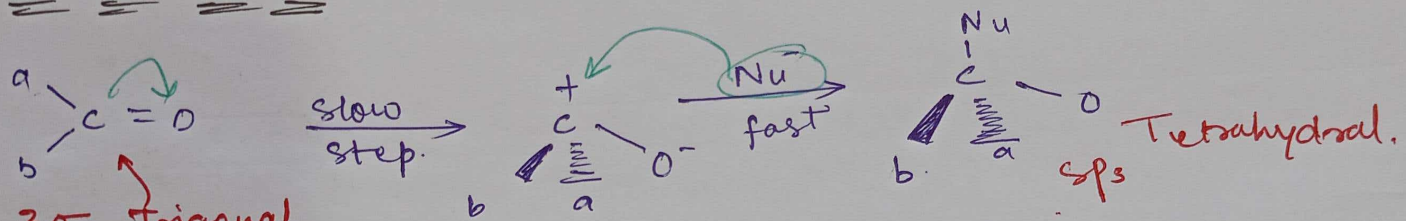
CHEMICAL PROPERTY

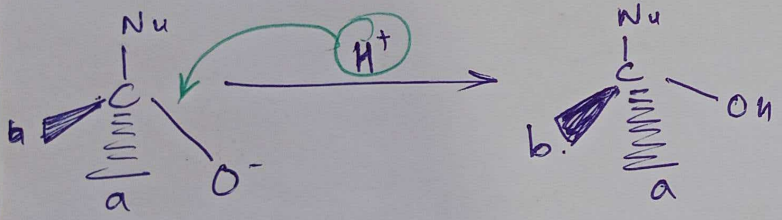
① Nucleophilic Addition Reaction :-





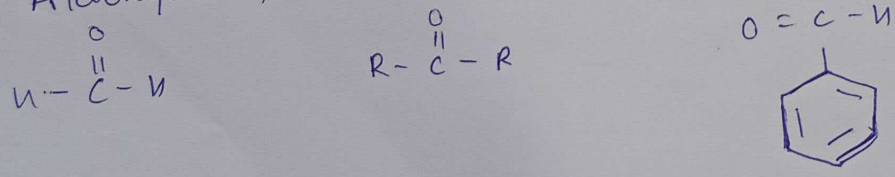
MECHANISM :-

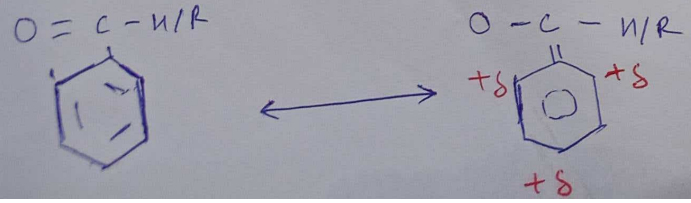




REACTIVITY :- Due to steric effect.

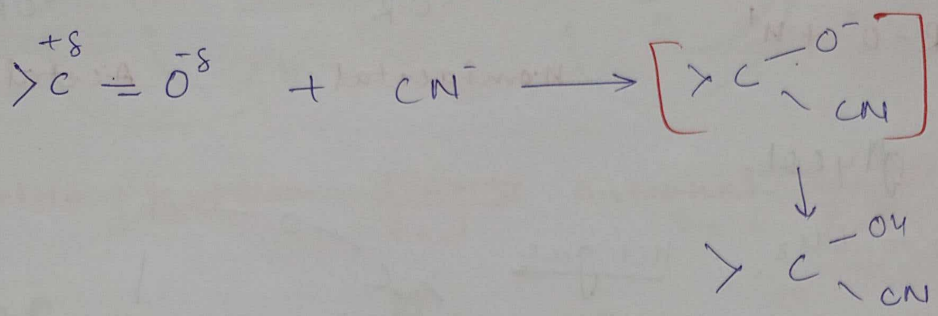
Aldehyde > Ketone > Benzaldehyde.





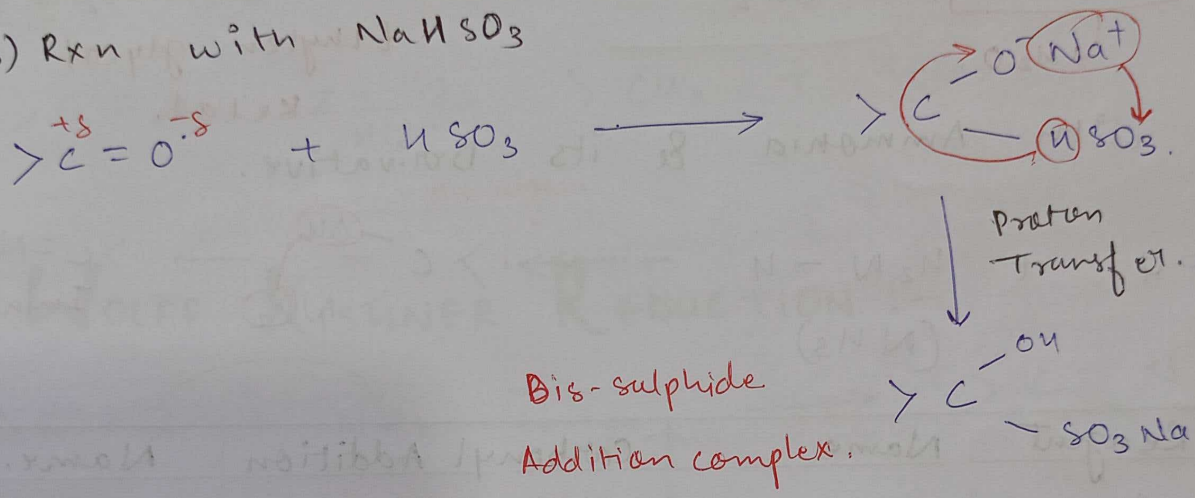
Example Of Nucleophilic Addition Rxn:-

a) Rxn with HCN (cyanide)



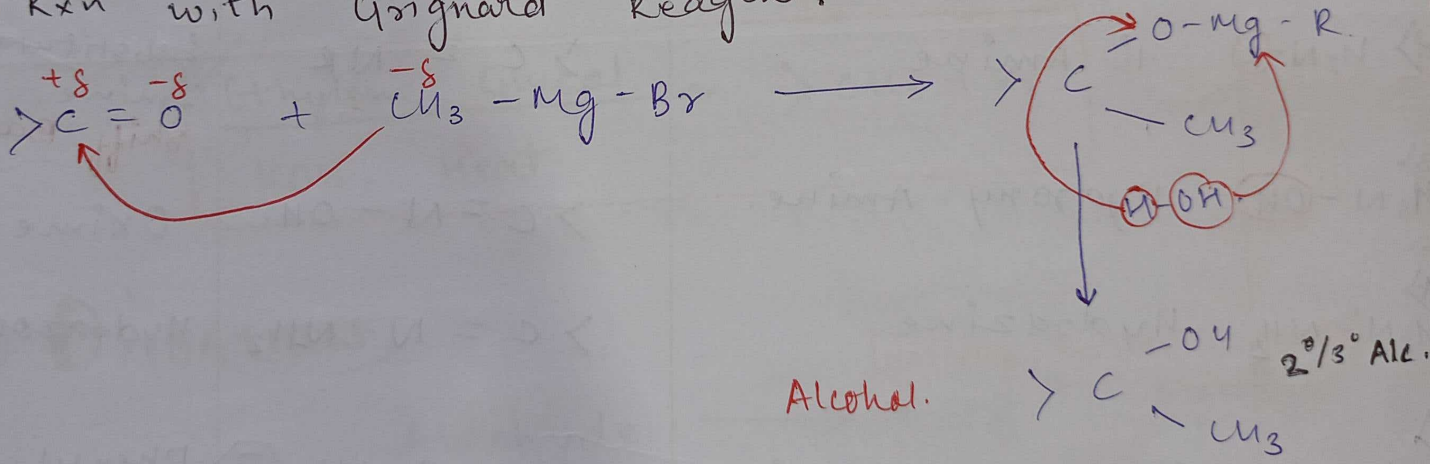
cyanohydrine.

b) Rxn with $NaHSO_3$



Bis-sulphide Addition complex.

c) Rxn with Grignard Reagent.



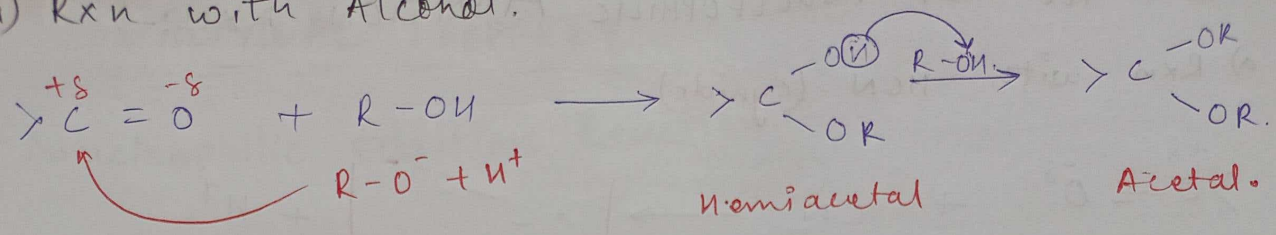
Alcohol.

Formaldehyde ($HCHO$) $\xrightarrow{G.R.}$ 1° Alc.

Any Aldehyde ($R-CHO$) $\xrightarrow{G.R}$ 2° Alc

Ketone $\xrightarrow{G.R.}$ 3° Alc

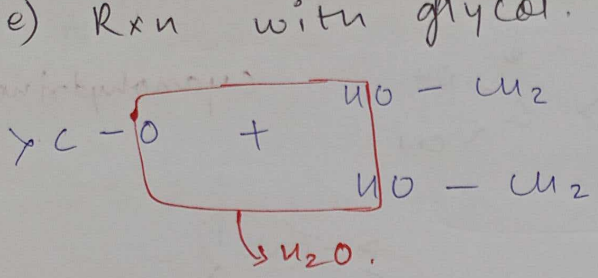
d) Rxn with Alcohol.



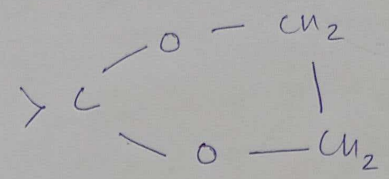
Hemiacetal

Acetal.

e) Rxn with glycol.

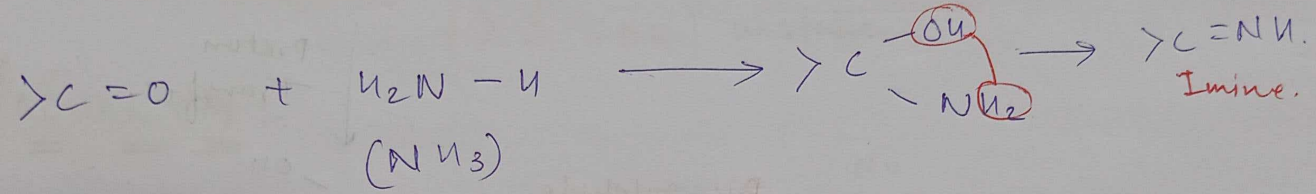


HCl gas



Ethylen glycol ketal.

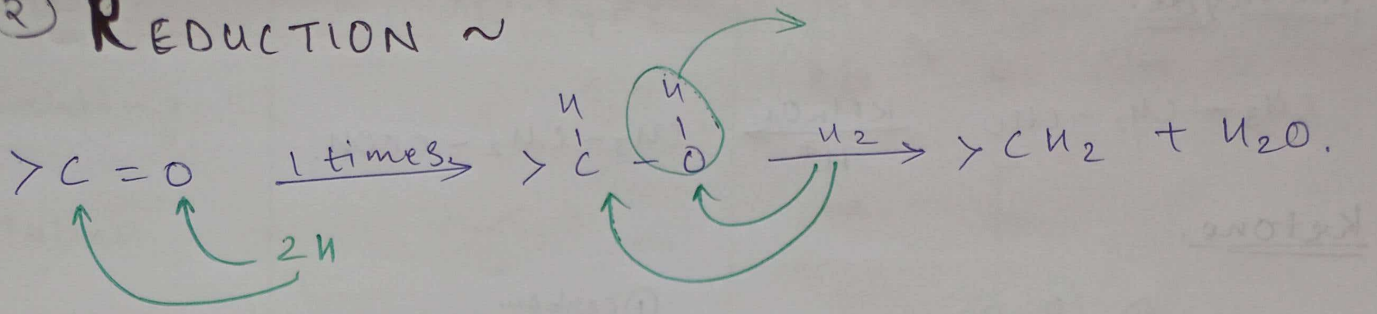
f) Rxn with Ammonia & its Derivative.



(NH_3)

Z	Reagent Name	Carbonyl Addition	Name.
1) H_2N-H	Ammonia.	$>C=NH$	Imine.
2) H_2N-R	1° Amine	$>C=NR$	Substituted Imine. Shiff Base.
3) H_3N-OH	Hydroxy Amine.	$>C=N-OH$.	Oxime.
4) H_2N-NH_2	Hydrazine.	$>C=N-NH_2$	Hydrazone.
5) $H_2N-NH-C_6H_5$	Phenyl Hydrazine.	$>C=N-NH-C_6H_5$	Phenyl hydrazone.
6) 2,4-DNP	2,4-DNP hydrazine.	$>C=N-NH-C_6H_3(NO_2)_2$	2,4 DNP hydrazone.
7) $-NH-\overset{O}{\overset{\|}{C}}-NH_2$	Semi Carbazide.	$>C=N-NH-\overset{O}{\overset{\|}{C}}-NH_2$	Semi carbazone.

② REDUCTION ~



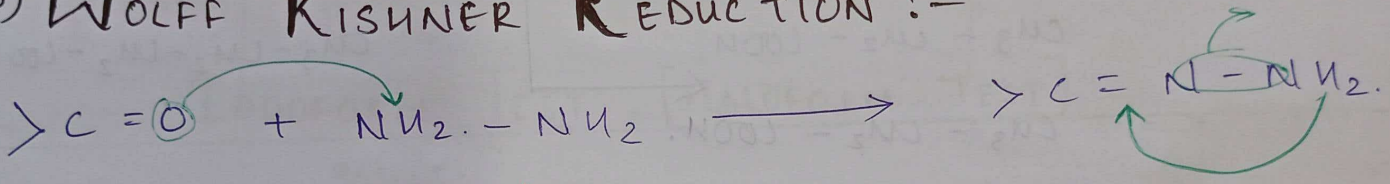
Alde / Ketone $\xrightarrow[\text{Red}]{\text{1 times}}$ Alcohol $\xrightarrow[\text{Red}]{\text{1 times}}$ $>CH_2$ (Hydro carbon).

(a) CLEMMENSON REDUCTION :-

$$>C=O \xrightarrow[HCl]{Zn\text{-}Hg} >CH_2 + H_2O.$$

Zinc Amalgum.

(b) WOLFF KISHNER REDUCTION :-



Hydrazine.

Ethylene Glycol. KOH. Heat → $>CH_2 + H_2$.

③ OXIDATION.

Aldehyde → ($KMnO_4$, $K_2Cr_2O_7$, HNO_3) strong Ox. Agent.

Aldehyde → Mild Ox. Agent. (Cu / 573k)

- 5C gives 5C Acid.
- 2C gives 2C Acid.

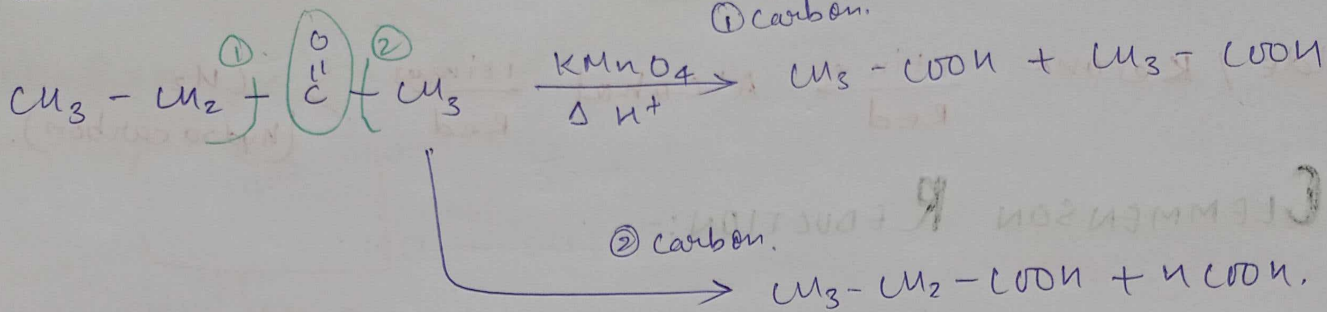
Ketone → strong Ox. Agent + Heat.

5C → 3C, 1C, 4C.

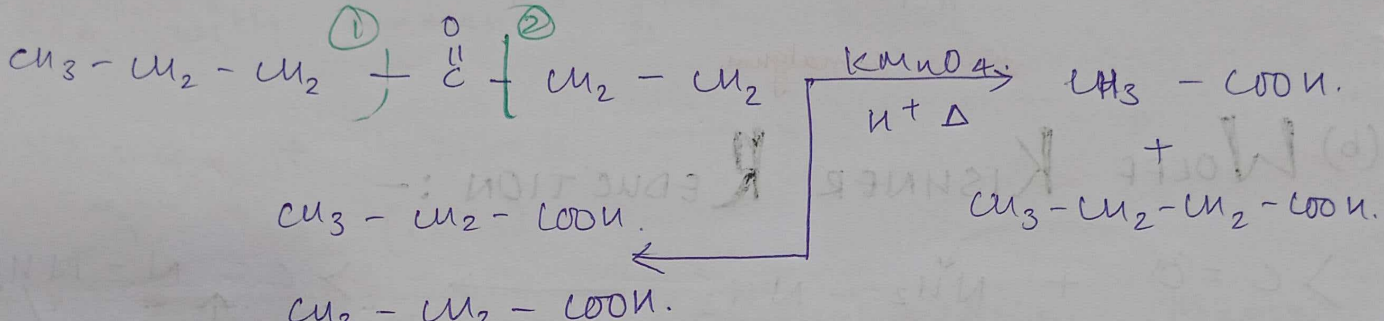
Aldehyde.

$CH_3 - CH_2 - CHO \xrightarrow[H^+]{KMnO_4} CH_3 - CH_2 - COOH.$

Ketone.



Eg:



Test (Only for Aldehyde).

Fehling Test

- Reagent (Cu^{+2})
  - Fehling A $\longrightarrow$ $CuSO_4$.
  - Fehling B $\longrightarrow$ Sodium Potassium Tartrate. (Rochelle salt)
- Basic Medium.
- colour $\longrightarrow$ Red Brown ppt.

Over All Rxn $(R-COO^- - Cu_2O)$

$$R-CHO + Cu^{+2} - 5OH^- \longrightarrow Cu_2O + H_2O + R-COO^-$$

Tollen Test.

- Reagent. $(Ag(NH_3)_2)^+$.
- Basic Medium.
- Colour $\longrightarrow$ Silver white ppt.

Over All Rxn.

$$R-CHO + 2(Ag(NH_3)^+) + 3OH^- \longrightarrow RCOO^- + \underbrace{2Ag}_{\text{Silver white Ppt.}} + 2H_2O + 2NH_3.$$

Test	Aldehyde	Ketone
Fehling.	✓	×
Tollen.	✓	×
Shiff Base.	✓	×
Sodium Bis-sulphate Test.	✓	✓
2.4. DNP.	✓ (yellow ppt)	✓

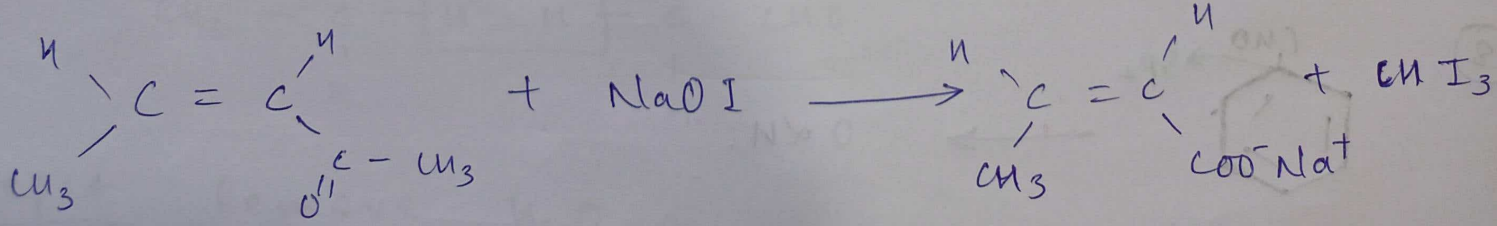
IODOFORM TEST [HALOFORM TEST]

$(CH_3-\overset{O}{\overset{\|}{C}}-)$

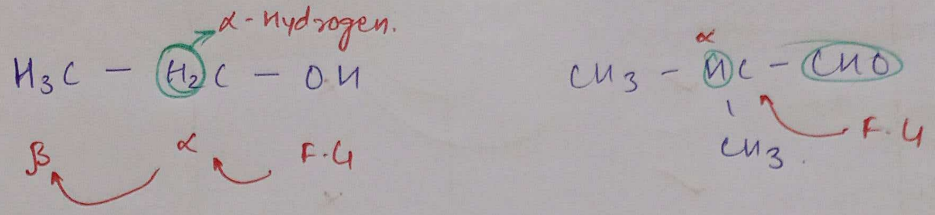
$(CH_3-\overset{OH}{\overset{|}{CH}}-)$

} Detection of free methyl in Any Aldehyde/. Ketone / Alcohol.

$$CH_3-CH_2-\overset{O}{\overset{\|}{C}}-CH_2 + NaOI \longrightarrow CH_3-CH_2-\overset{O}{\overset{\|}{C}}-O^-Na^+ + CHI_3$$



④ Rxn Due To α-Hydrogen.



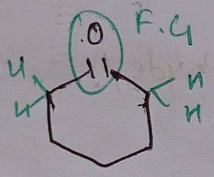
▸ Identification of α - Hydrogen.

① $CH_3 - CHO$ ⟶ 3 α H

② $CH_3 - CH(CH_3) - CH_2 - CHO$ ⟶ 2 α H

③ $CH_3 - CO - CH_3$ ⟶ 6 α H.

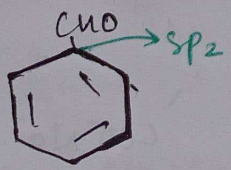
④ $CH_3 - C(CH_3)_2 - CO - CH_2 - CH_2$ ⟶ 2 α H.

⑤ 

⟶ 4 α H.

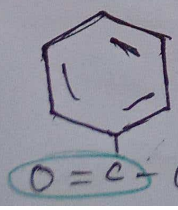
⑥ $CH_2 = CH - CHO$ ⟶ 0 α H.
(CH → sp_2; F.G)

⑦ $CH_3 - C(OH)(CH_3) - CH_3$ ⟶ 0 α H
(F.G)

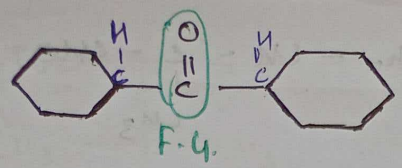
⑧ 

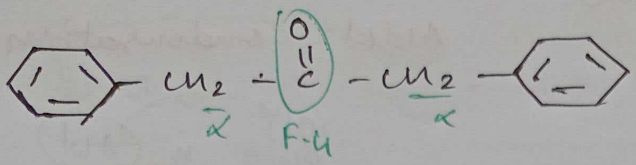
⟶ 0 α H.

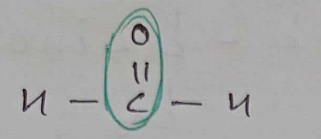
⑨ $CH_3 - CO - CH_2 - CH_3$ ⟶ 5 α H.

⑩ 

⟶ 3 α H.

(11)  → 2 α H.

(12)  → 4 α H.

(13)  → 0 α H.

→ α H → Present → Aldol condensation.
Ketol
cross aldol
cross ketol.

Any strong Base.
Dil. KOH
Dil. NaOH
Dil. $Ca(OH)_2$

→ α H → Not Present → Cani zaro Rxn

4.1 Aldol condensation Product.

$CH_3 - CHO$ dil. NaOH $CH_3 - CHO$, → $CH_3 - CH = CH - CHO$.
$CH_3 - CHO$.

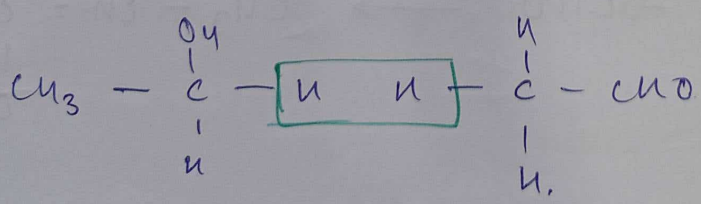
Step 1. Write 2 times of same Reagent.

$CH_3 - CHO + CH_3 - CHO$.

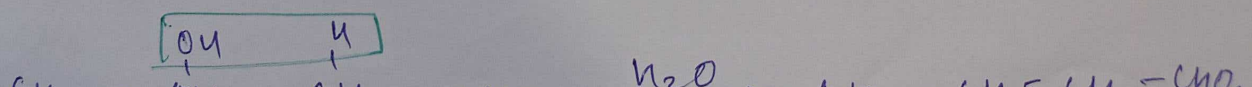
Step 2: (I st) Reduction (II) Same with α - H.

$CH_3 - \overset{\alpha}{CH_2} - \underset{F.G}{OH} + \overset{\alpha}{CH_3} - \underset{F.G}{CHO}$

Step 3: Show α H and Add Both.



Step 4. Remove H_2O.



Q. $CH_3-CH_2-CHO \xrightarrow[F.G.]{dil.\ NaOH} CH_3-CH_2-CH=C(CH_3)-CHO$

$CH_3-CH_2-\underset{F.G.}{CHO} \quad \underset{\alpha}{H_2C}(CH_3)-CHO$

Aldol Condensation.

$CH_3-CH_2-\underset{OH}{C}(H)-\underset{Ald}{C}(CH_3)-CHO$

Q. $CH_3-CH(CH_3)-CH_2-CHO \xrightarrow{dil.\ NaOH} CH_3-CH(CH_3)-CH_2-CH=C(CH_3)-CHO.$

$CH_3-CH(CH_3)-CH_2-CHO \quad H_2C(CH_3)-CHO$

(Condensation product)

$CH_3-CH(CH_3)-CH_2-CH(OH)-C(H)(CH_3)-CHO.$

(Aldol)

CROSS ALDOL ~

Q. $CH_3-CHO + CH_3-CH_2-CHO \xrightarrow{dil.\ KOH}$

(1) $CH_3-CHO + CH_3-CHO \longrightarrow CH_3-CH=CH-CHO$

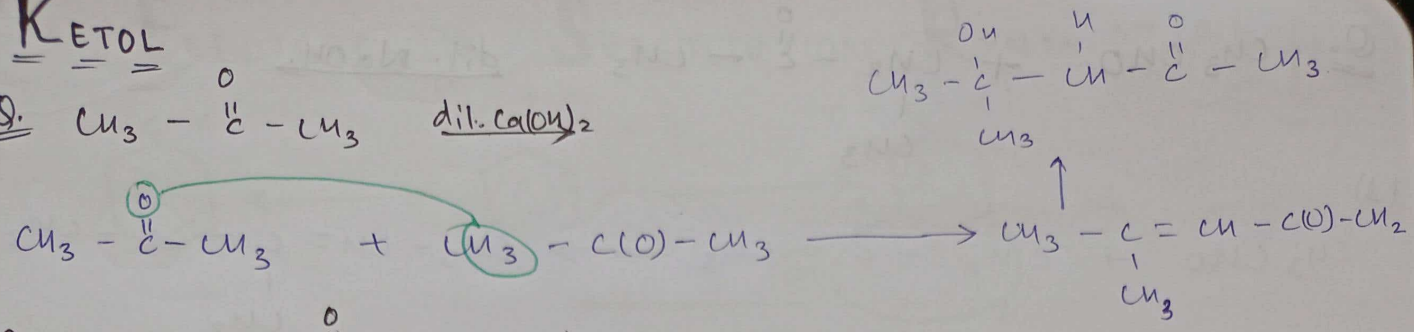
(2) $CH_3-CH_2-CHO + CH_3-CH(CH_3)-CHO \longrightarrow CH_3-CH_2-CH=C(CH_3)-CHO$

(3) $CH_3-CHO + CH_3-CH(CH_3)-CHO \longrightarrow CH_3-CH=C(CH_3)-CHO$

(4) $CH_3-CH_2CHO + CH_3CHO \longrightarrow CH_3-CH_2-\underset{\underset{CHO}{|}}{CH}=CH_2$

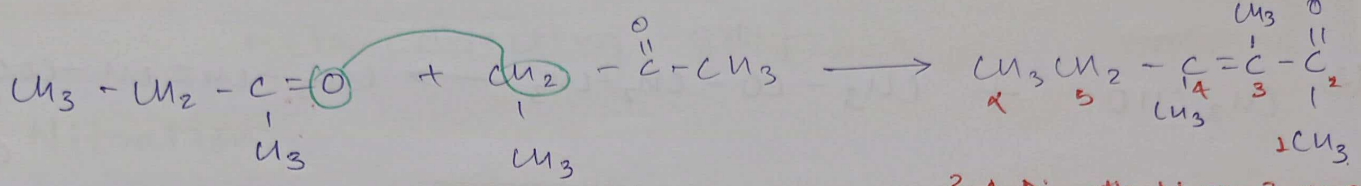
KETOL

Q. $CH_3-\overset{O}{\overset{\|}{C}}-CH_3$ $\xrightarrow{dil.\ Ca(OH)_2}$



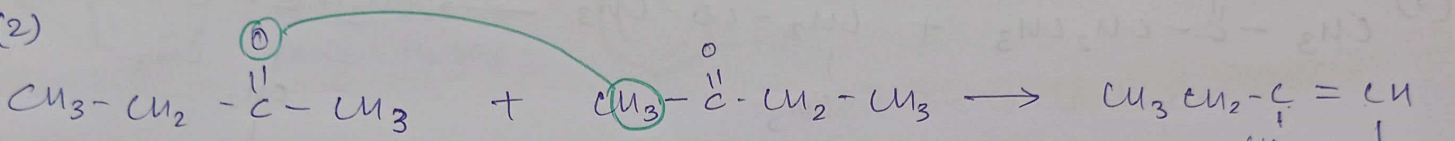
Q. $CH_3-CH_2-\overset{O}{\overset{\|}{C}}-CH_3$ $\xrightarrow{dil.\ KOH}$

(1)

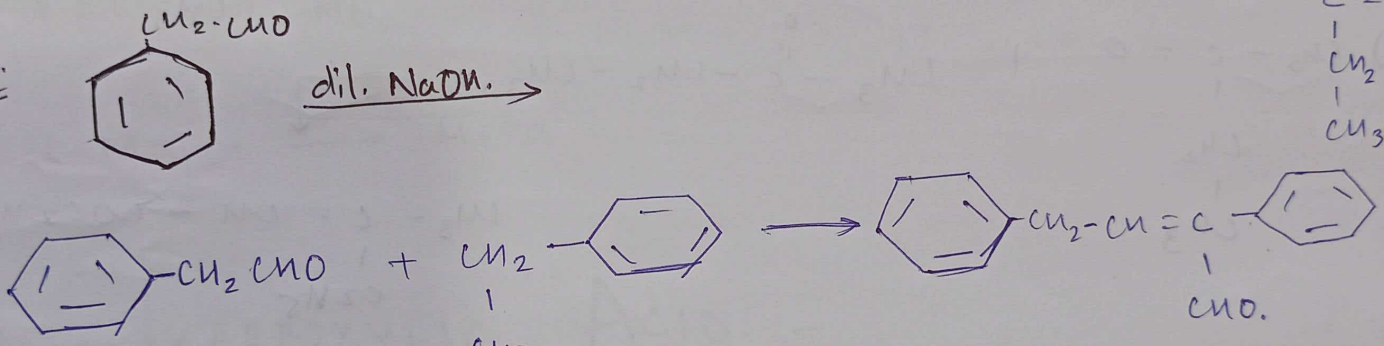


3,4, Dimethyl hex-3-ene -2-one.

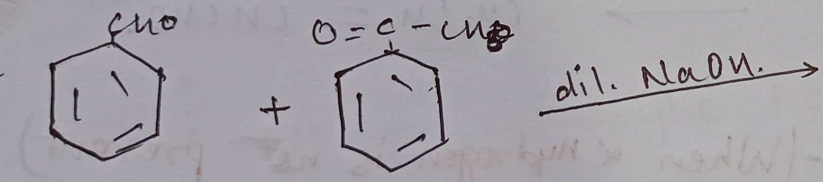
(2)



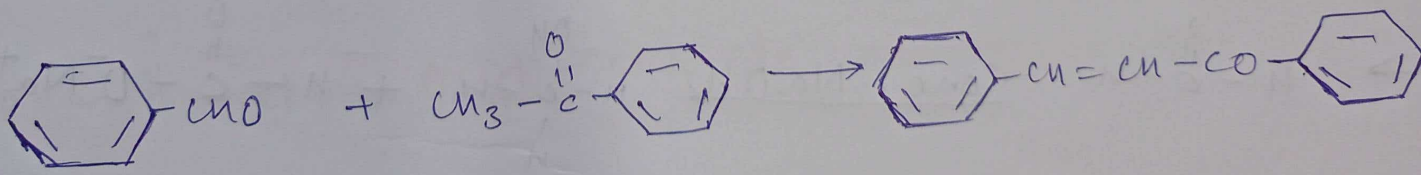
Q.



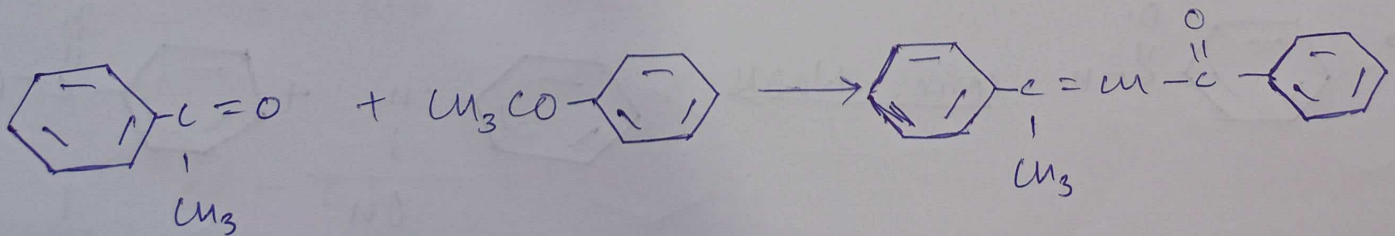
Q.



(1)



(2)



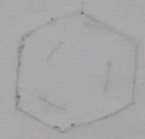
Q. $CH_3CHO + CH_2(CH_3)-C(=O)-CH_3 \xrightarrow{dil.\ NaOH}$

(1) $CH_3CHO + CH_2(CH_3)-C(=O)-CH_3 \longrightarrow CH_3-CH=C(CH_3)-CO-CH_3$

(2) $CH_3CHO + CH_3-CO-CH_2-CH_3 \longrightarrow CH_3-CH=CH-CO-CH(CH_3)$

(3) $CH_3-C(=O)-CH_2CH_3 + CH_2(CH_3)-CO-CH_3 \longrightarrow CH_3-C(CH_3)=C(CH_2CH_3)-CO-CH_3$

(4) $CH_3-C(=O)-CH(CH_2CH_3)-CH_3 + CH_3-C(=O)-CH_2-CH_3 \longrightarrow$

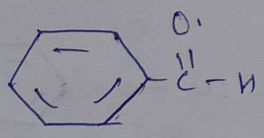
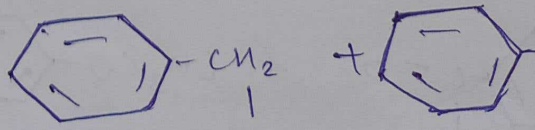


$CH_3-C(C_2H_5)=CH-COC_2H_5$

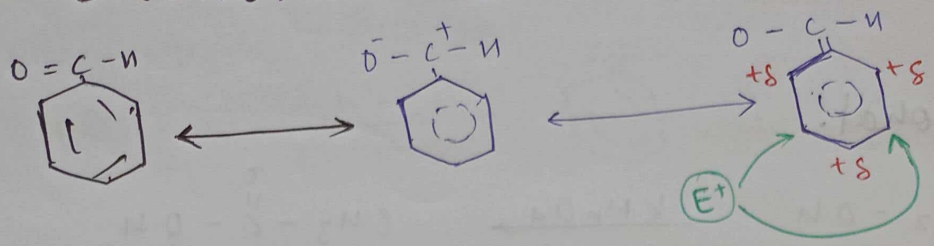
(5) $CH_3CHO + CH_3CHO \longrightarrow CH_3CH=CHCHO$.

4.2. CANNIZARO RXN :- (When α hydrogen is not present)

$\longrightarrow H-C(=O)-H \xrightarrow{Conc.\ NaOH} H-C(OH)(H)-H + H-C(=O)-O^-Na^+$

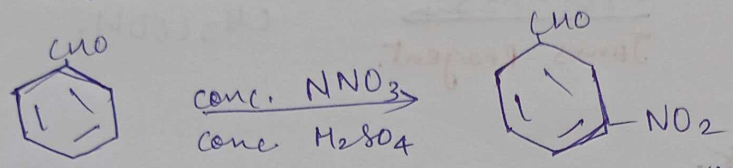
$\longrightarrow$  $\xrightarrow{conc.\ NaOH}$ 

5. Electrophilic Substitution Rxn:-



Conclusion: Aldehyde and ketone are meta directing group.

5.1 Nitration.



m-Nitro Benzaldehyde.

* $E^+ \longrightarrow NO_2^+$

* Major ⟶ Meta

Carboxylic Acid:-

1. $R - \overset{O}{\overset{\|}{C}} - OH$ Carboxylic Acid
2. $R - \overset{O}{\overset{\|}{C}} - Cl$ Acyl chloride.
3. $R - \overset{O}{\overset{\|}{C}} - NH_2$ Amide.
4. $R - \overset{O}{\overset{\|}{C}} - OR'$ Ether
5. $R - \overset{O}{\overset{\|}{C}} - O - \overset{O}{\overset{\|}{C}} - R$ Acid Anhydride.

MOP

① From Alcohol.

a) $CH_3 - CH_2 - OH \xrightarrow[\text{Alkaline}]{KMnO_4} CH_3 - \overset{O}{\overset{\|}{C}} - OH$.

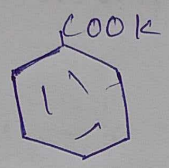
↳ $CH_3 - \overset{O}{\overset{\|}{C}} - H$.

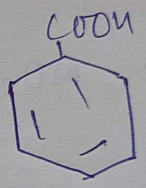
b) $CH_3 - CH_2 - OH \xrightarrow[\text{Jones Reagent.}]{CrO_3 - H_2SO_4} CH_3COOH$.

② From Hydro carbons.

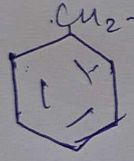
Toulene.

$\xrightarrow[KOH]{KMnO_4}$ Heat





+ KOH.



$\xrightarrow[\text{Heat}]{KMnO_4 \mid KOH}$

Benzoic Acid.

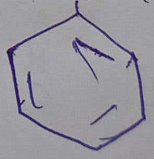
③ From Nitriles.

$CH_3 - C \equiv N \xrightarrow{H_2O} CH_3 - \overset{O}{\overset{\|}{C}} - NH_2 + H-OH$

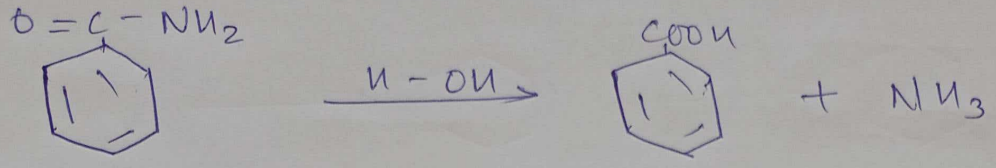
↳ $CH_3 - COOH$.

+ H_2O ⟶

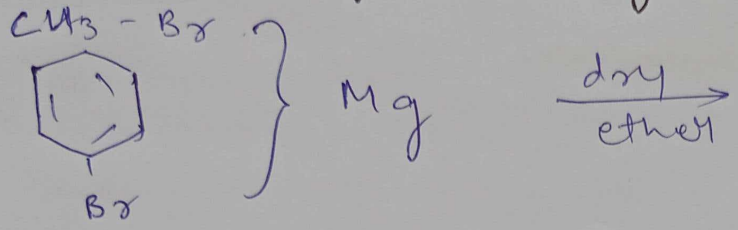
$\xrightarrow{H-OH}$

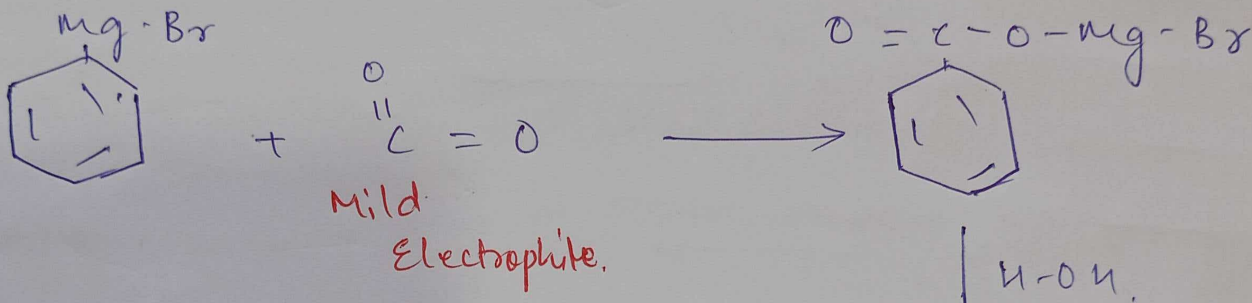


④ From Amides.

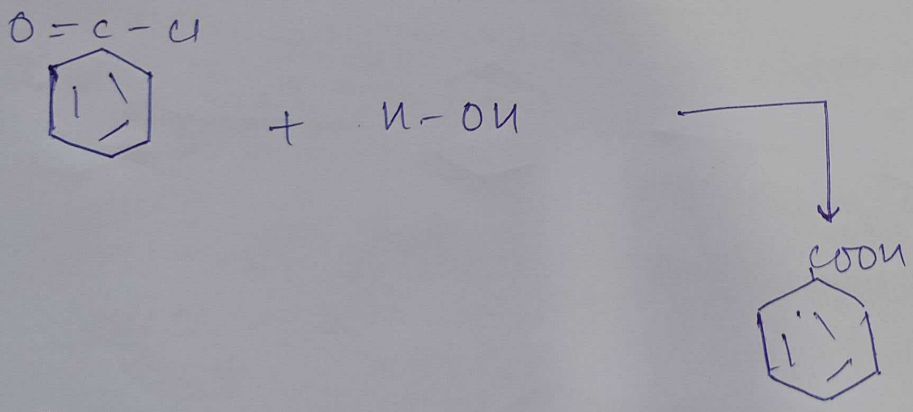


⑤ From Grignard Reagent.

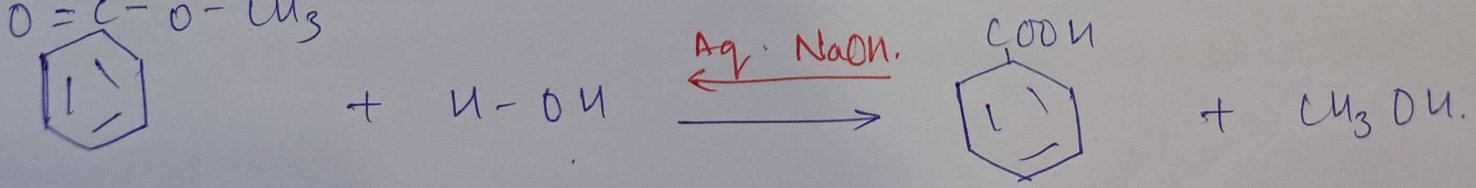




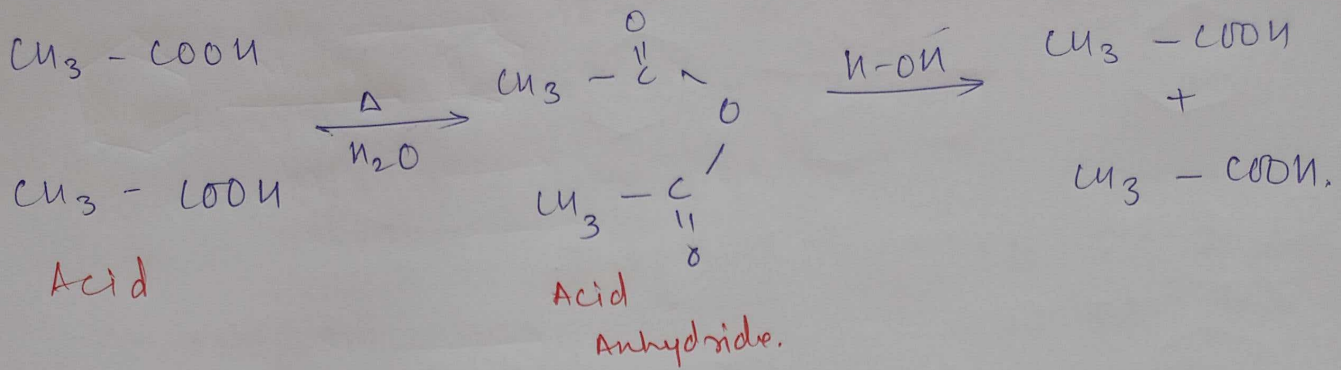
⑥ From Acyl Chloride



⑦ From Ester.

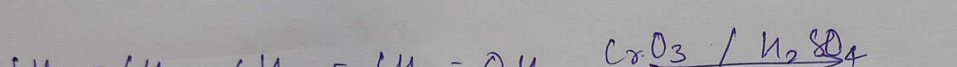


(8) From Acid Anhydride.

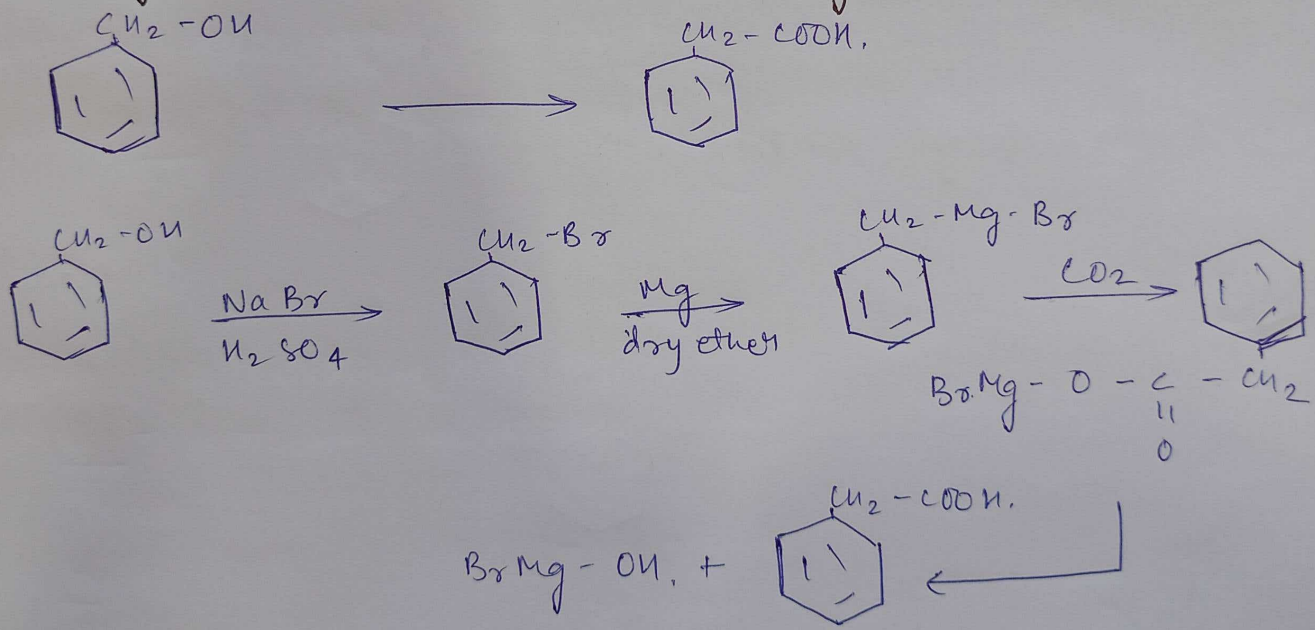


CONVERSION:

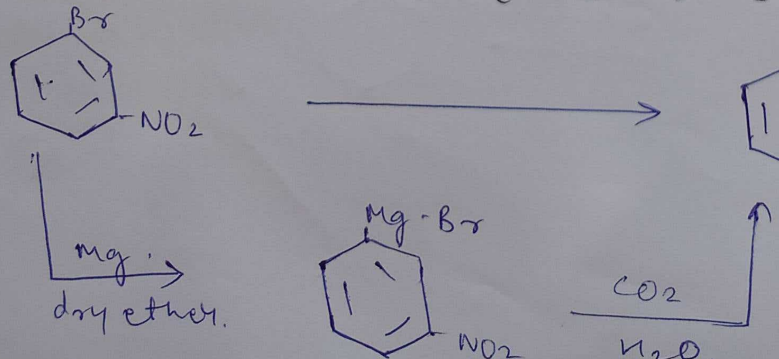
(1) Butan-1-ol ⟶ Butanoic Acid.



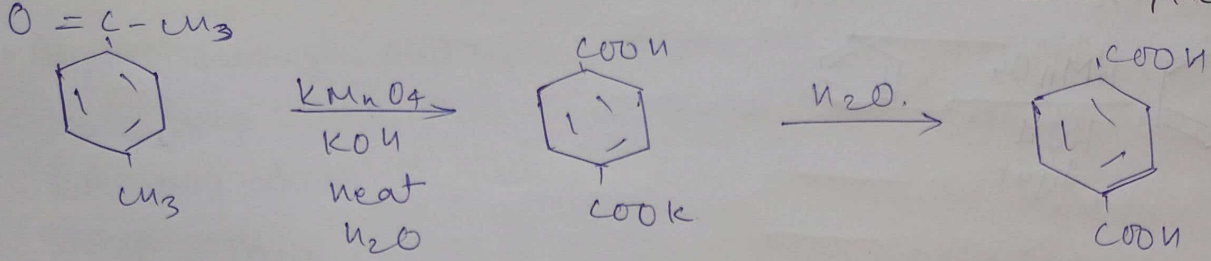
(2) Benzyl Alcohol ⟶ Phenyl Ethanoic Acid.



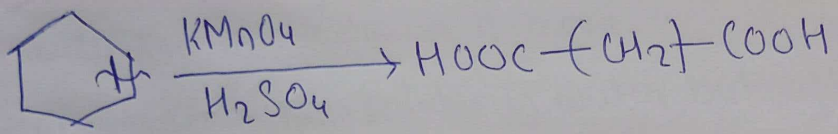
(3) 3 Nitro ~~Bromo~~ Benzene ⟶ 3 Nitro Benzoic Acid.



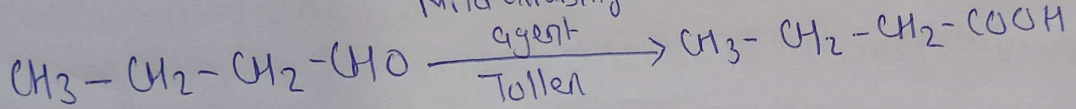
④ 4- Methyl Acetophenone ⟶ Benzene 1, 4 Di + Carboxylic Acid.



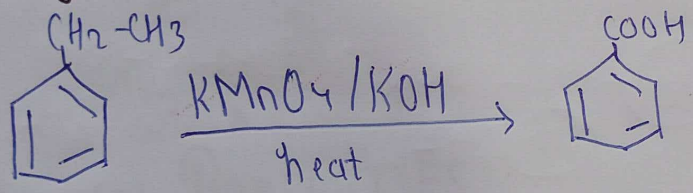
⑤ Cyclohexane ⟶ Adipic acid



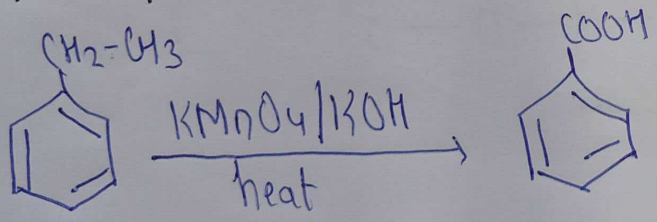
⑥ Butanol ⟶ Butanoic Acid



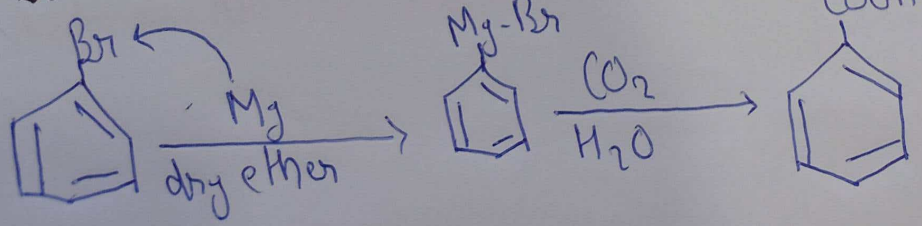
⑦ Ethyl Benzene



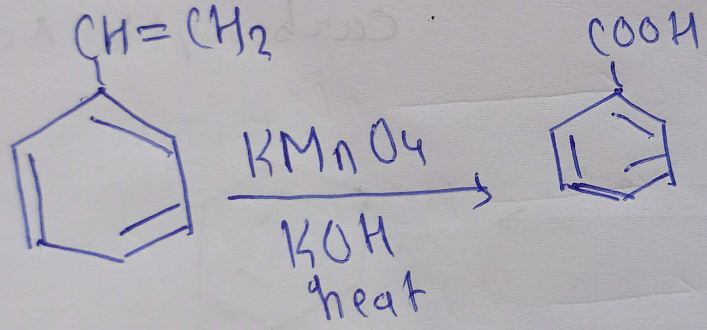
⑧ Acetophenone



⑨ Bromo Benzene



(10) Phenyle ethane ⟶



PHYSICAL PROPERTIES :-

- Aliphatic Carbon upto 9 carbonylic acid are colourless liquid. & Higher are wax like solid.
- Lower aliphatic are odourless but the speeefic smell due to other impurities
- Acetic Acid are found in the Dimer form in vapour phase also.
- Melting Point : Their melting point boiling point are higher than aldehyde, ketone and Alcohol. Due to making of hydrogen bond with each other.

Hydro Carbon < Ether < Aldehyde < Ketone < Alc < Acid.
(5 carbon)

upto 5 carbon they are soluble in water and higher are insoluble due to the Hydrophobic the Hydrocarbon group.

- Benzoic acid are much lesser or insoluble in cold water but they are soluble in polar organic Solvent like Benzene, Ether, Alcohol, Chloroform etc.

CHEMICAL PROPERTIES ~

① Acidic Effect

$$Acid + Na \longrightarrow Salt + H_2 \uparrow$$

$$Acid + NaOH \longrightarrow Salt + H_2O.$$

$$Acid + \left.\begin{matrix} Na_2CO_3 \\ NaHCO_3 \end{matrix}\right\} \rightarrow Salt + H_2O + CO_2$$

$$2CH_3-COOH + 2Na \longrightarrow CH_3COO^-Na^+ + H_2\uparrow.$$

$$CH_3-COOH + NaOH \longrightarrow CH_3-COO^-Na^+ + H_2O.$$

1°, 2°, 3° Benzoic Acid. ?

Acidic Effect → H^+ give $\alpha \frac{-I}{+I}$ $\alpha \frac{-M}{+M}$.

$-I \longrightarrow -NO_2, -CN, -OH, Cl$ etc.

$+I \longrightarrow -CH_3, -CH_2-CH_3$

$-M \longrightarrow -NO_2, -CN, -\overset{O}{\overset{\|}{C}}-H, -\overset{O}{\overset{\|}{C}}-OH, =, \equiv$

$+M \longrightarrow$ L.P., $-OH, -CH_3, -Cl, -NH_2$.

Q. Arrange in the order of Acidic effect?

a) $CH_3 - COOH$ (+I)

b) $H - COOH$ ⟷

c) $CH_3 - CH_2 - COOH$. (2+I)

d) $CH_3 - CH(CH_3) - COOH$. (3+I)

b > a > c > d.

Q. Arrange in the order of Acidic effects?

a) $NO_2 - CH_2 - COOH$. high - 2.

b) $Cl - CH_2 - COOH$. 3rd high

c) $CN - CH_2 - COOH$ 2nd high.

d) $CH_3 - CH_2 - COOH$. +I

a > c > b > d.

Q. Arrange in the order of Acidic effects?

a) $CH_3 - \overset{O}{\overset{\|}{C}} - OH$. +I

b) $CH \equiv C - CH_2 - \overset{O}{\overset{\|}{C}} - OH$. 1st -I

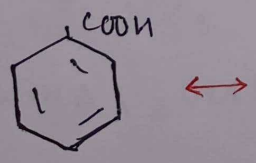
c) $CH_2 = CH - \overset{O}{\overset{\|}{C}} - H$ — Resonance — OH. 2nd -I

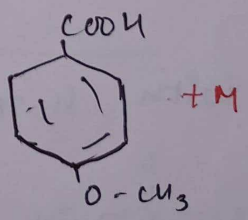
Resonance → M effect.

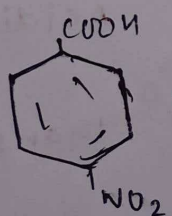
d) $H - \overset{O}{\overset{\|}{C}} - OH$. ⟷

c > b > d > a

Q.

a)  ⟷

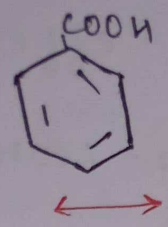
b)  +M

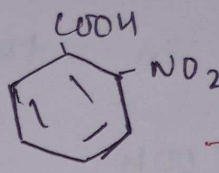
c)  -M.

d)  +I.

c > a > b > d.

Q.

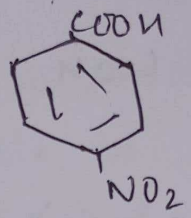
a) 

b) 

−M
−I near.

c) 

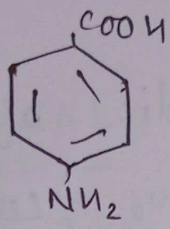
−I

d) 

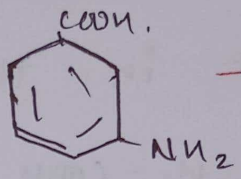
−M
−I far.

b > d > c > a.

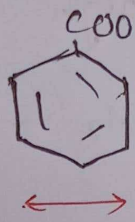
Q.

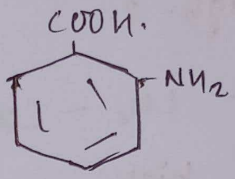
a) 

+M
−I far.

b) 

−I

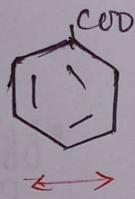
c) 

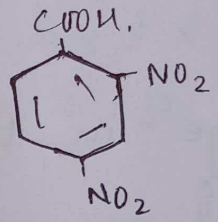
d) 

+M
−I near.

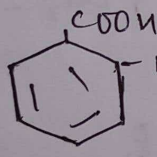
b > c > d > a.

Q.

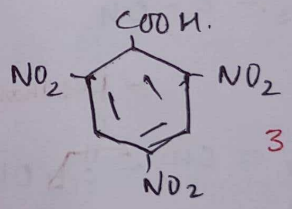
a) 

b) 

2−M.

c) 

1−M

d) 

3−M.

d > b > c > a.

(2) Replacement of $-\overset{\overset{O}{\|}}{C}-OH$ → OH group.

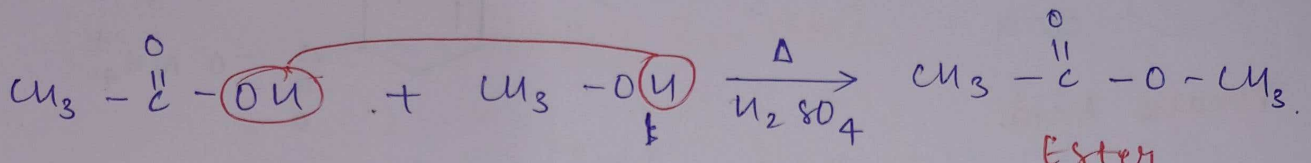
Ex: Rxn with H_2SO_4 / P_2O_5 / H^+ / HNO_3 / Δ Heat.

Ex: $CH_3-\overset{\overset{O}{\|}}{C}-OH$ + $CH_3-\overset{\overset{O}{\|}}{C}-OH$ ⟶ $CH_3-\overset{\overset{O}{\|}}{C}-O-\overset{\overset{O}{\|}}{C}-CH_3$ + H_2O

Acidic Anhydride

Ethanoic Anhydride

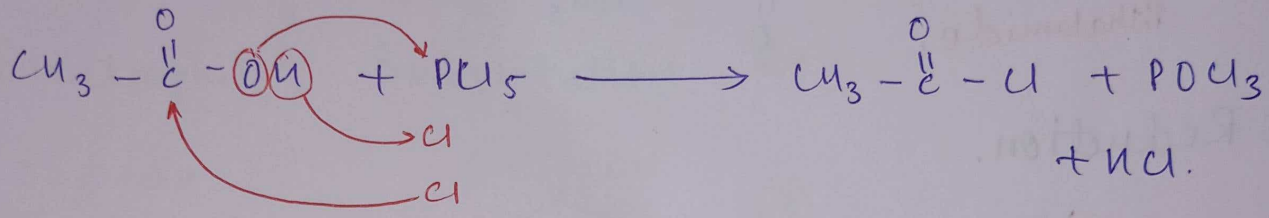
Ex: Rxn with alcohol.

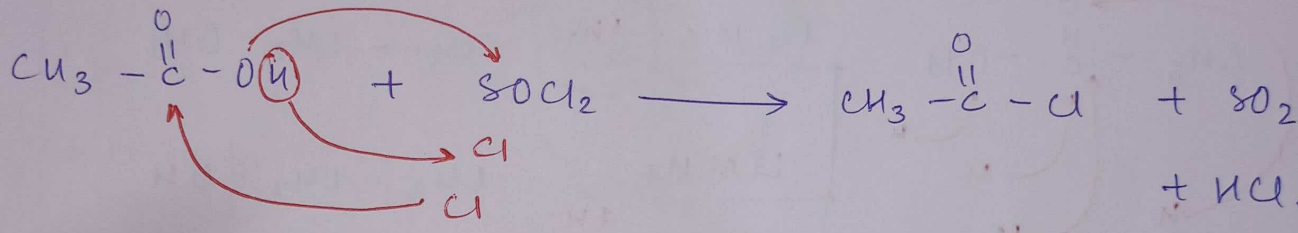


Ester.

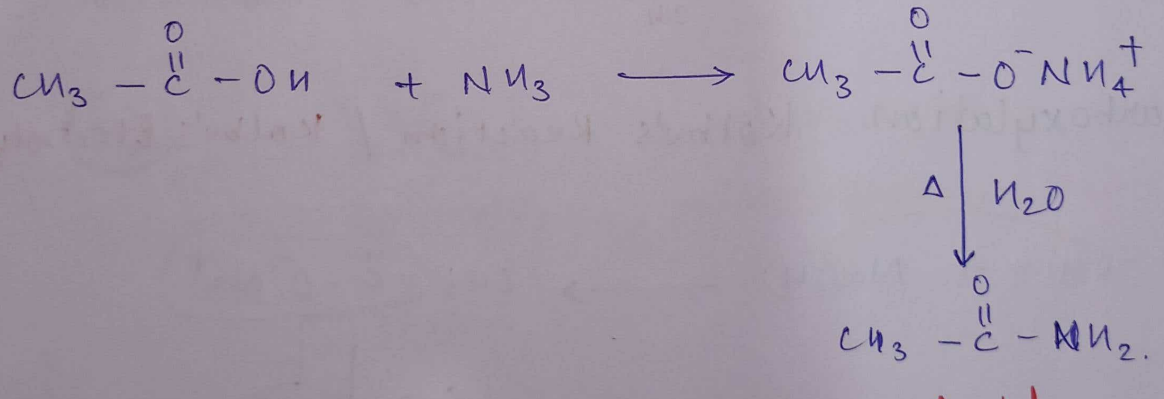
Ex: Rxn with PCl_3 / PCl_5 / $SOCl_2$

1) $3\,CH_3-\overset{O}{\overset{\|}{C}}-OH + PCl_3 \longrightarrow 3\,CH_3-\overset{O}{\overset{\|}{C}}-Cl + H_3PO_3$

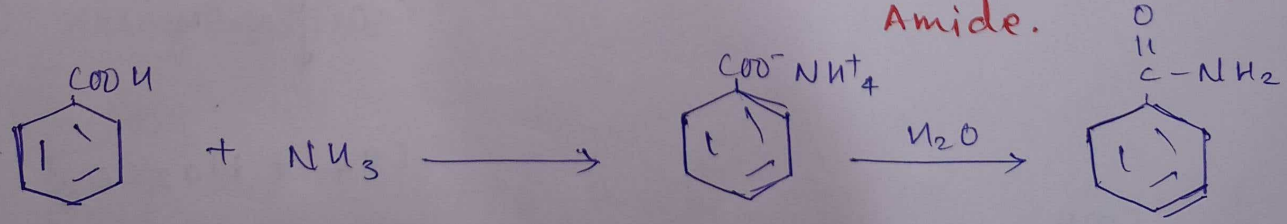
2) 

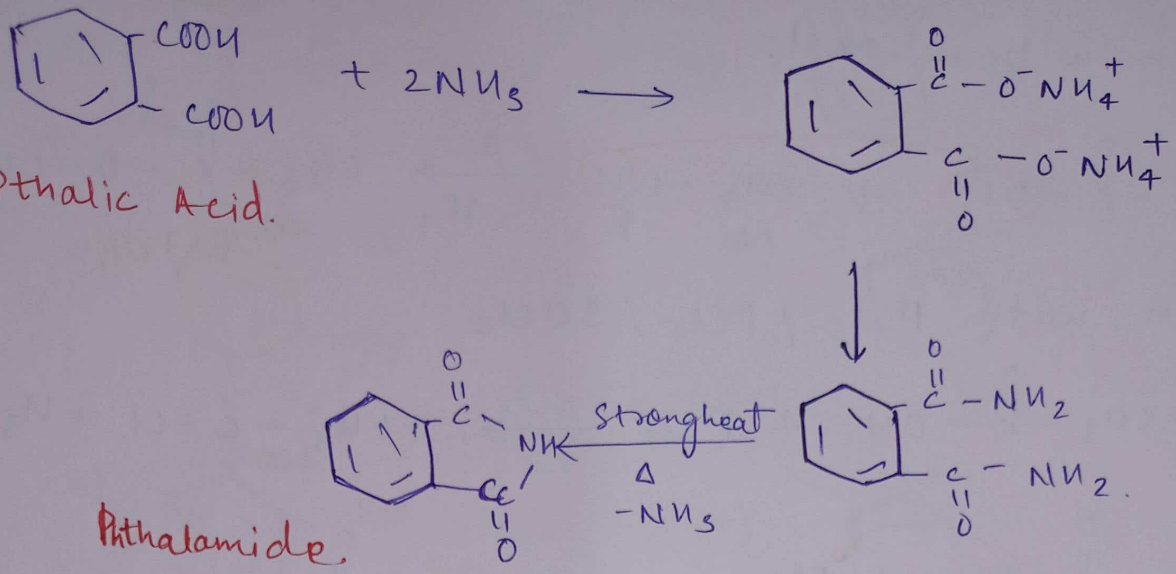
3) 

Ex: Rxn with Ammonia.



Amide.

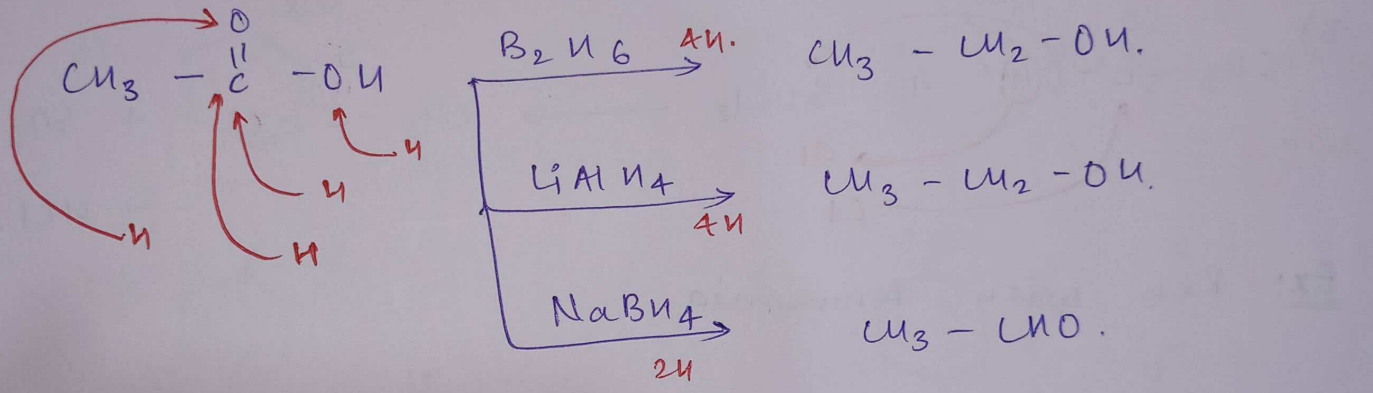




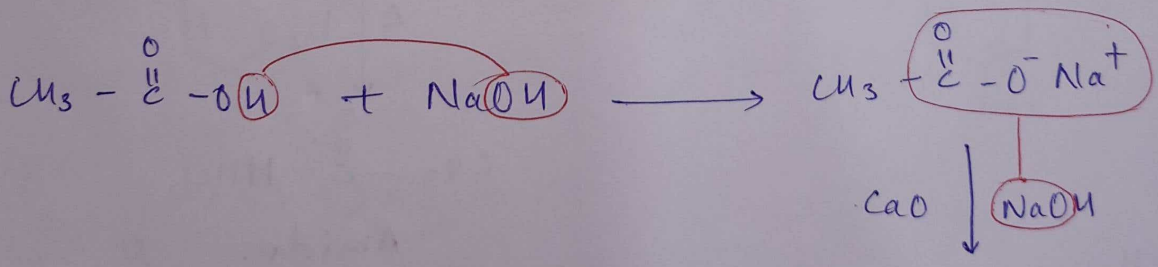
Pthalic Acid.

Pthalamide.

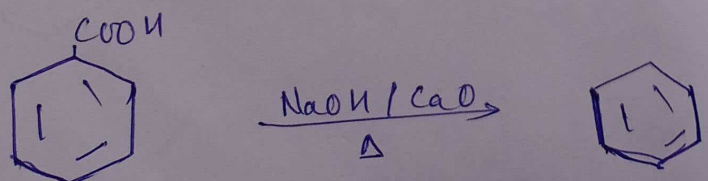
③ Reduction.



④ Decarboxylation. Kolbe's Reaction / Kolbe's Electrolysis

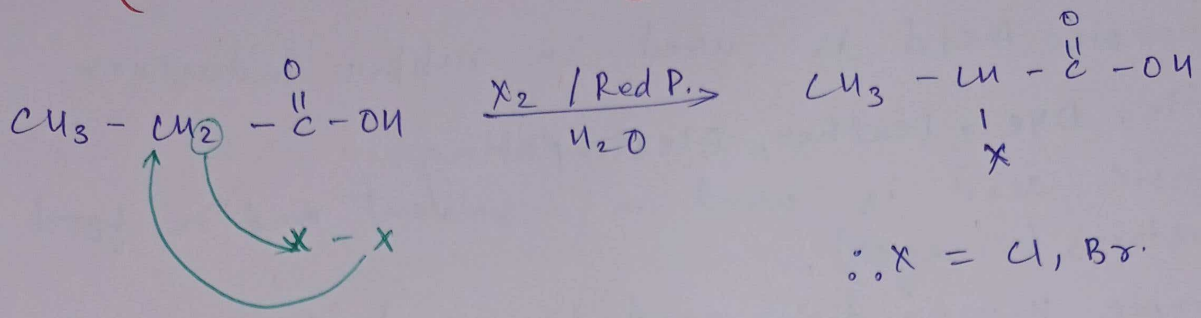


$CH_4 + Na_2CO_3$



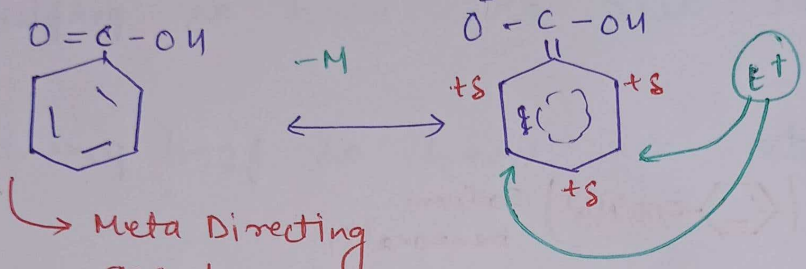
(5) Substitution Rxn. in Hydrocarbon Part.

(Hell - Volhald Zelinsky Reaction)



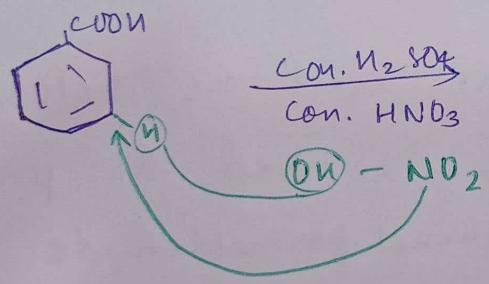
∴ X = Cl, Br.

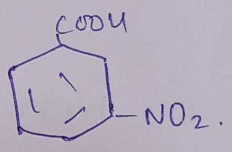
(6) Electrophilic Substitution Rxn.



↳ Meta Directing groups.

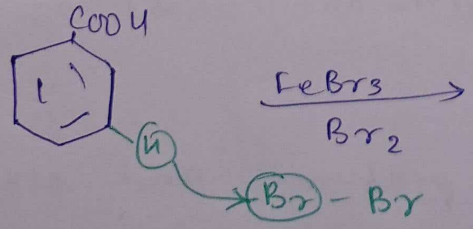
1) Nitration.

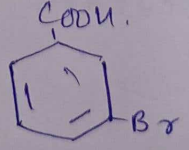




m - NitroBenzoic Acid

2) Halogenation.

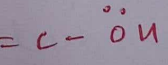




m - BromoBenzoic acid.

* Friedel Craft No Rxn.

Anhy $AlCl_3$ ⟶ Lewis Acid.



Uses Of Aldehyde And Ketone And Acid.

Acid

- Methanoic Acid is used in rubber industries.
- Textile, Dye, leather, Electroplating.
- Ethanoic acid is used in solvent and in food industries (Vinegar).
- ~~Hexanoic~~ Hexane dioic acid is used for making nylon 6-6. ($HOOC-(CH_2)_4-COOH$) (Adiapic acid)
- Ester of Benzoic acid are used as perfumes and fragrances.
- Sodium benzoate are used as food preservatives. Self life. ($C_6H_5COO^-Na^+$) Sodium benzoate.
- Higher fatty acid are used as making of soap and detergents.

Aldehyde :-

- Aldehyde and ketone both are used as solvent.
- Formaline - 40% formaldehyde is used as preserve Biological specimen, Backelite (Phenol-formaldehyde polymer resin).
- Urea-formaldehyde is used as glue.
- Vinylacetate, Ethylacetate both are used as polymer for drugs.
- Benzaldehyde are used as perfumes and other common solvent.
- Many aldehyde & ketone are also used as other specific products like Butylaldehyde, Vanilline, Acetophenone, camphor, are very famous for their odour & flavour.