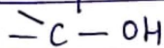


Hydroxy Derivative :-

Aliphatic



sp^3 (aliphatic)
(alcoholic)

Aromatic



sp^2
(Phenolic)

Type

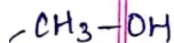
Mono hydroxy

Dihydroxy

Trihydroxy

Polyhydroxy

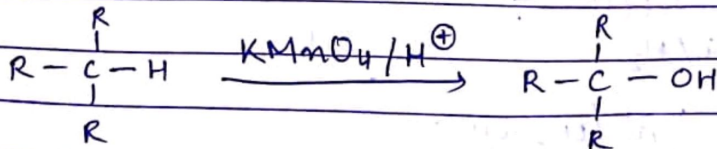
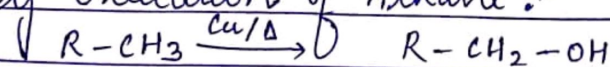
Deri



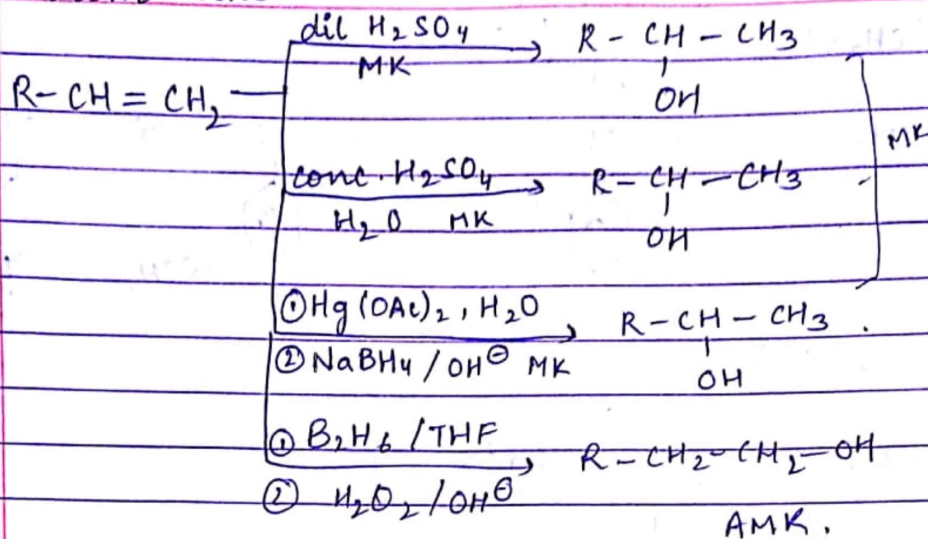
Super alcohol

General Method of Prep. :-

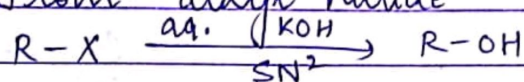
1. By Oxidation of Alkane :-



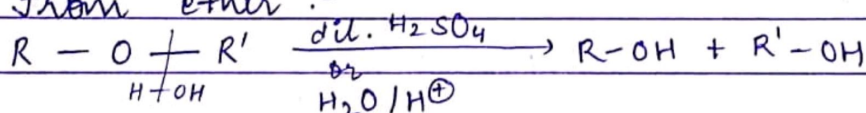
② From alkene :



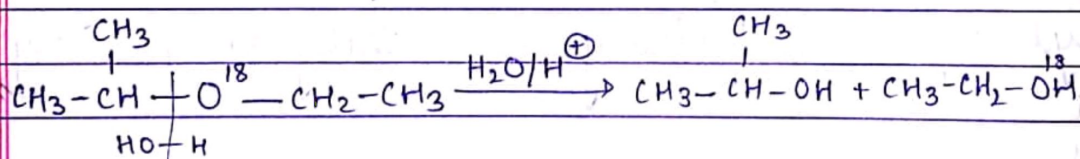
③ From alkyl halide



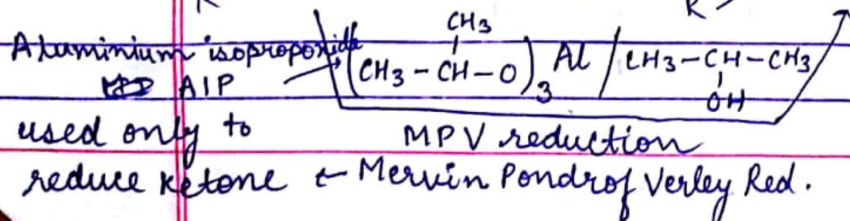
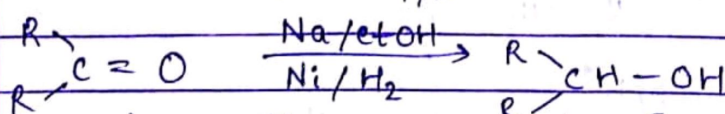
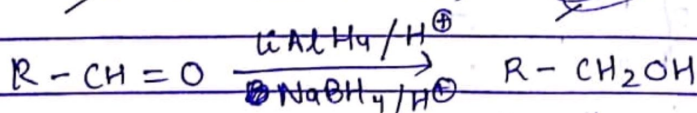
④ From ether :-



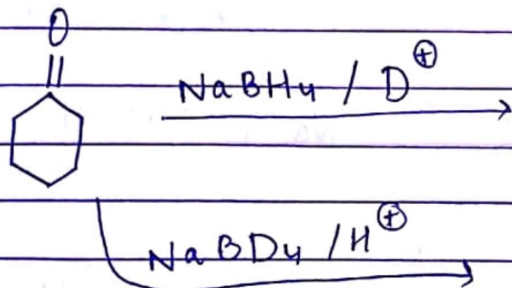
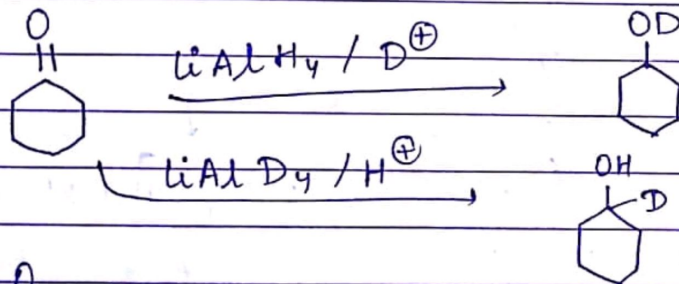
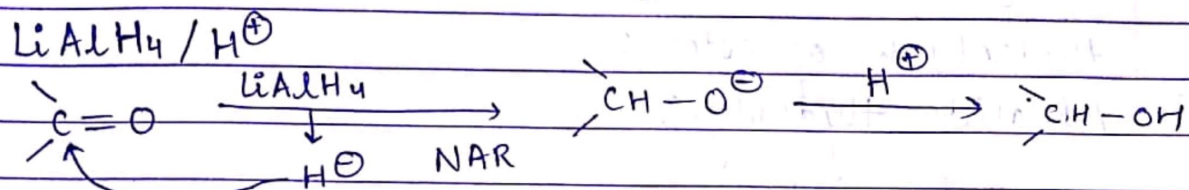
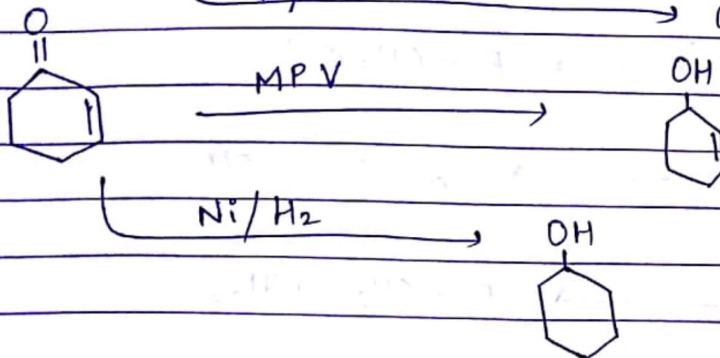
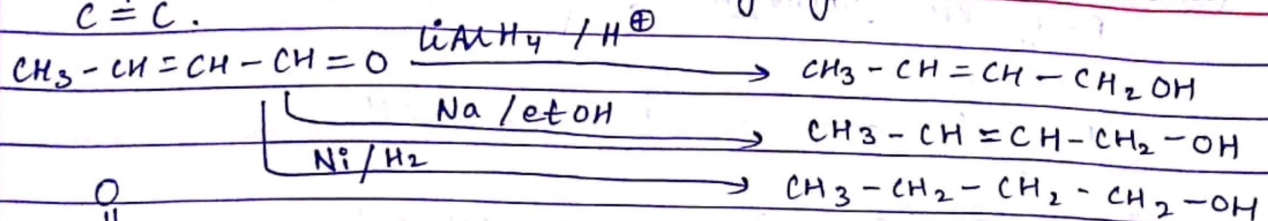
more stable
C-O bond
breaks



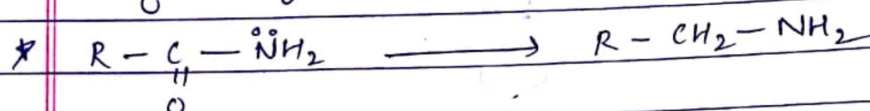
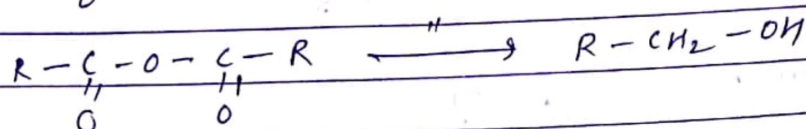
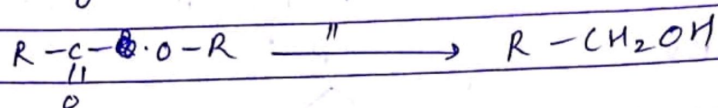
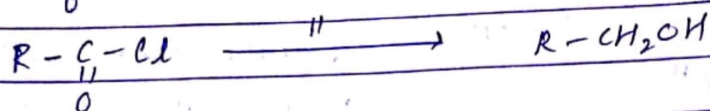
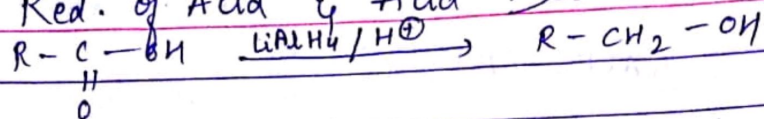
⑤ Reduction of Carbonyl Sub :-



Except Ni/H_2 other reducing agent do not reduce $\text{C}=\text{C}$.

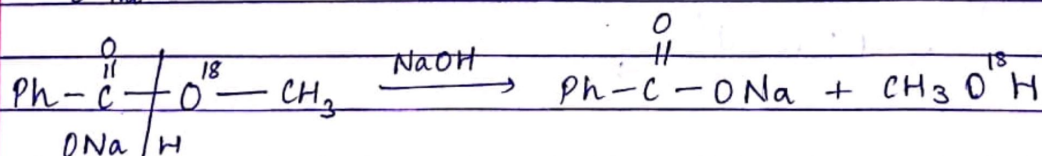
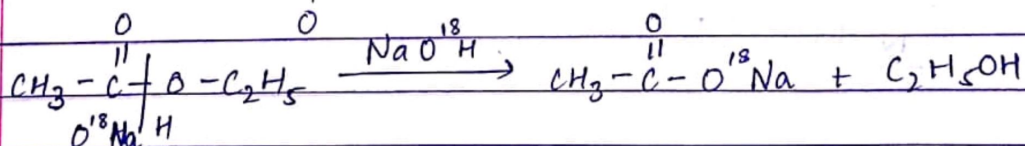
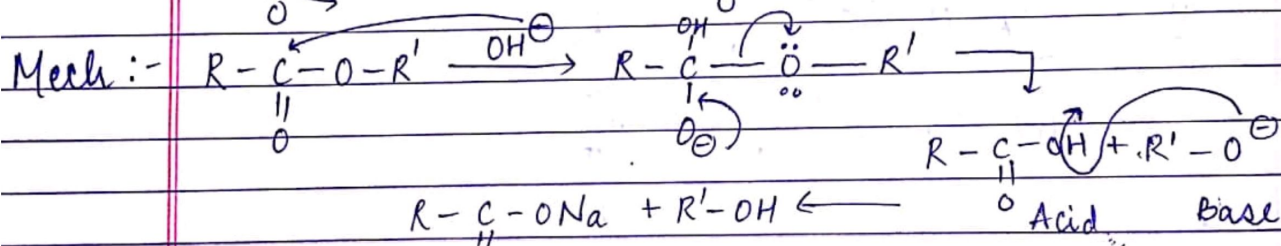
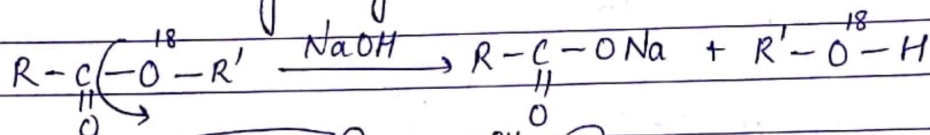


⑥ Red. of Acid & Acid Derivative :-

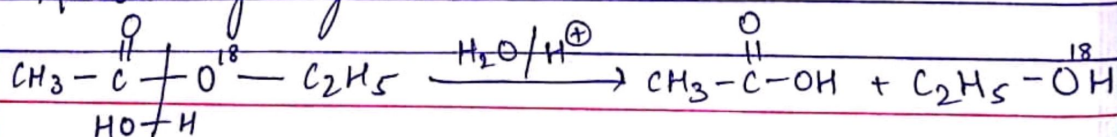


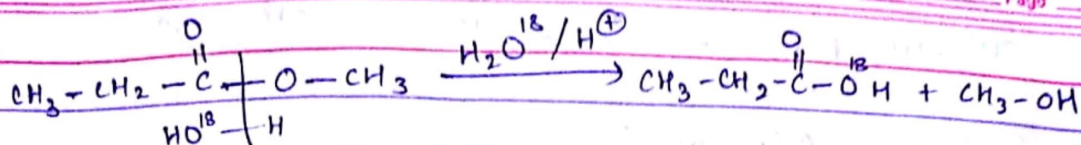
⑦ Hydrolysis of ester :-

① Alkaline Hydrolysis :-

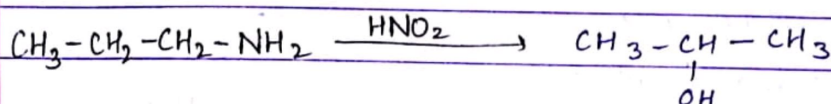
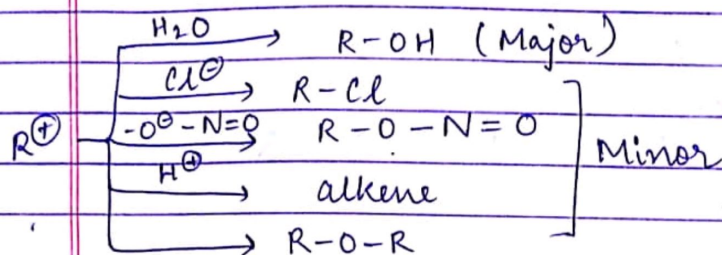
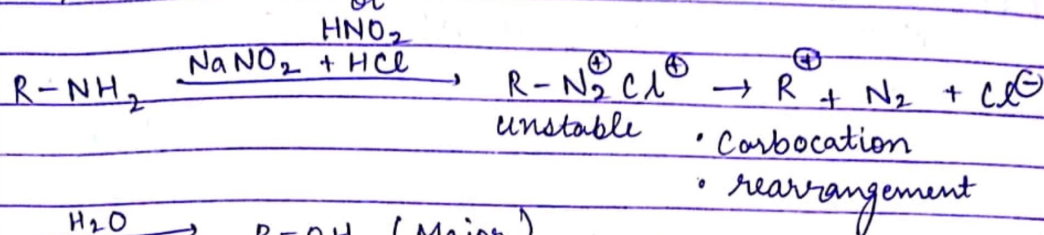
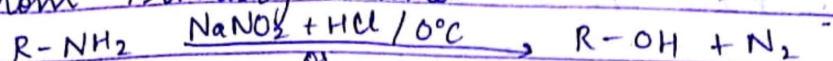


② Acidic hydrolysis :-

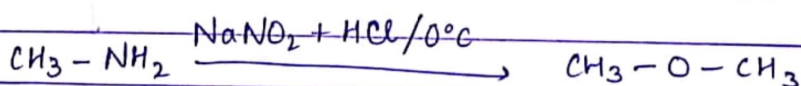




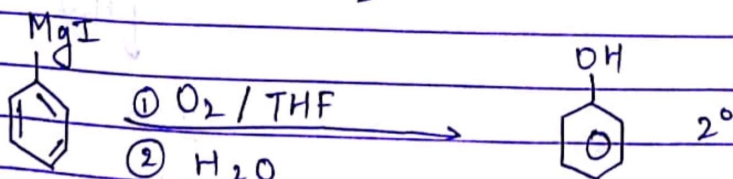
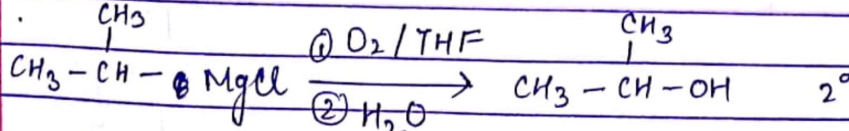
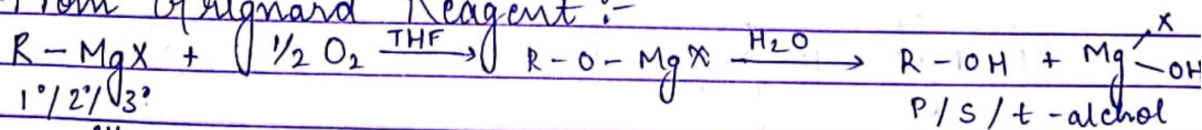
⑧ From Primary amines :-

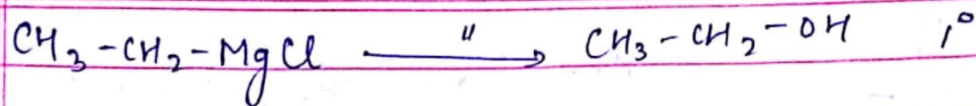


Exception

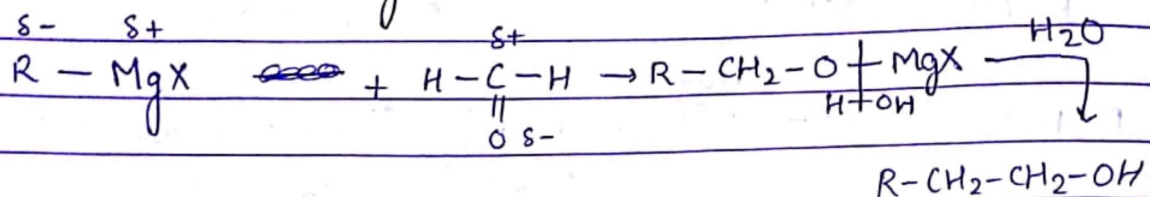


⑨ From Grignard Reagent :-

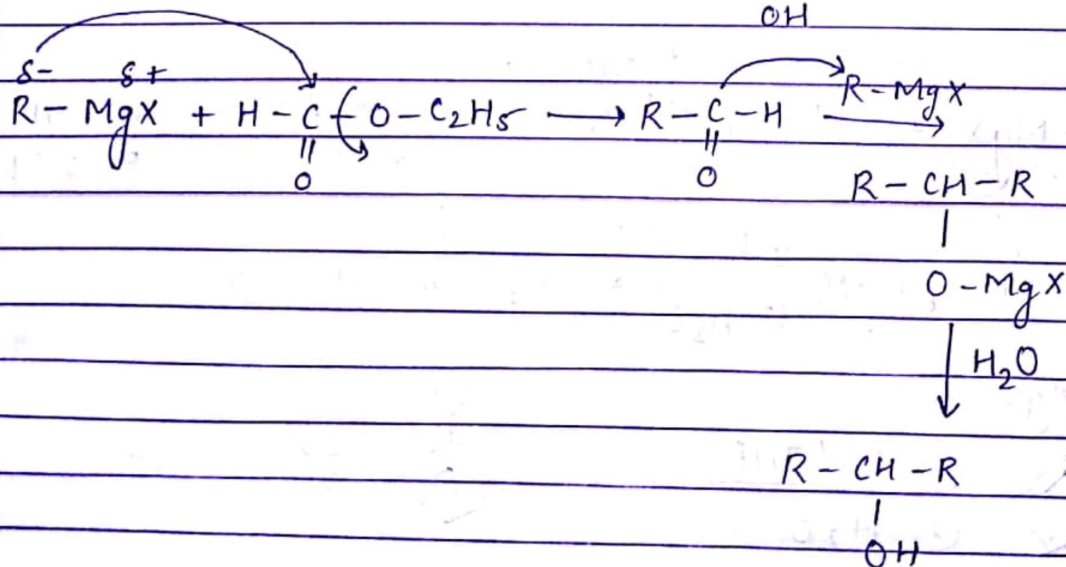
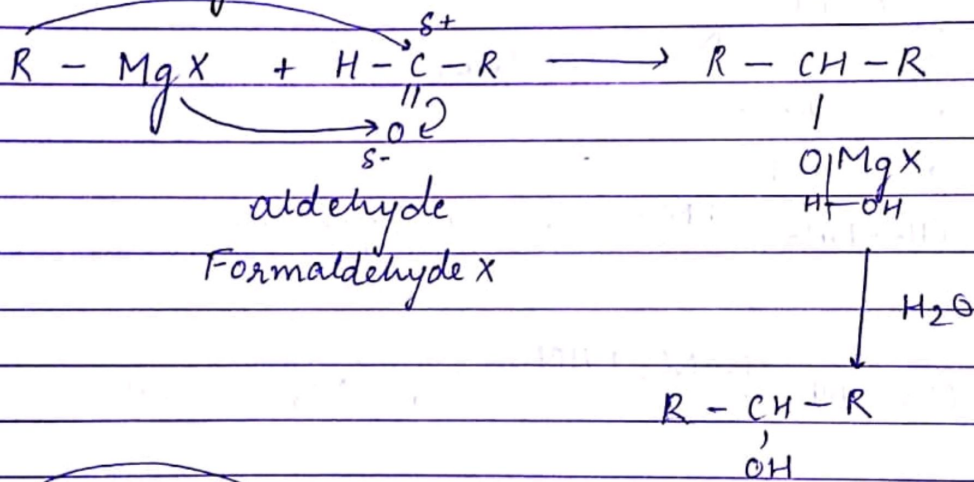




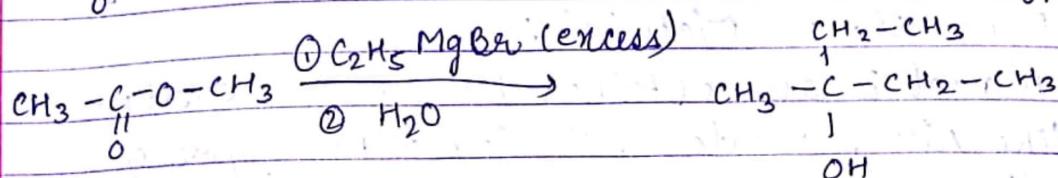
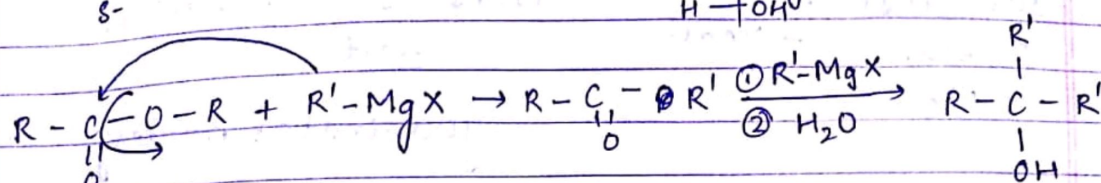
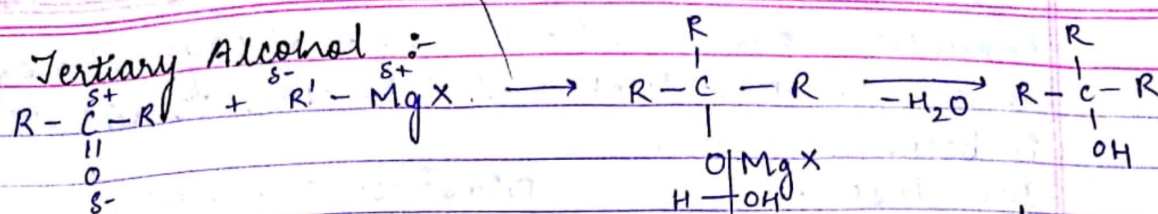
Primary Alcohol :-
with Formaldehyde :



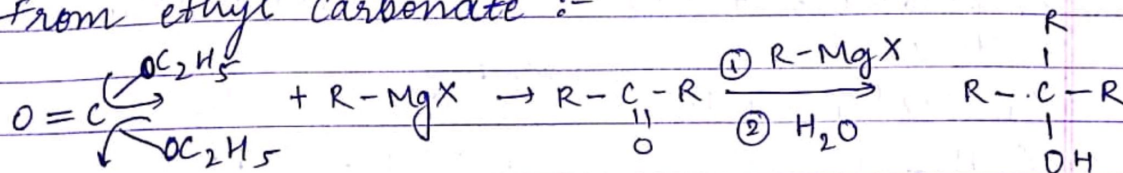
Secondary Alcohol :-



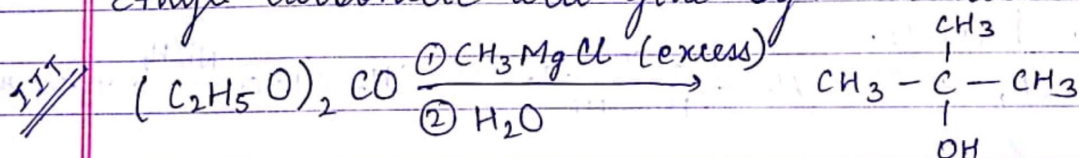
Tertiary Alcohol :-



From ethyl Carbonate :-

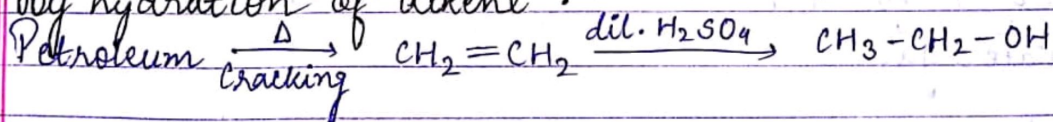


Ethyl carbonate will give sym. t-alcohol.



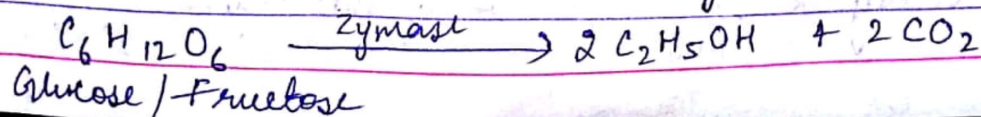
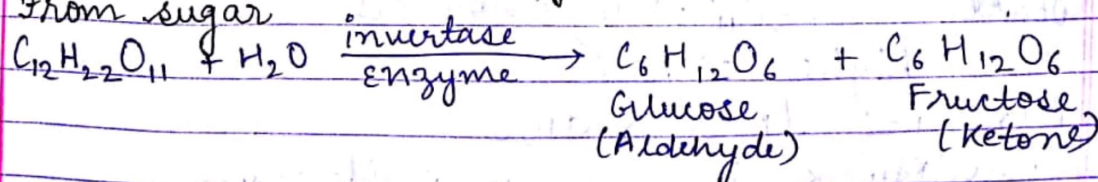
Industrial Preparation :-

(a) By hydration of alkene :-



(b) By fermentation of carbohydrates :-

(i) From sugar



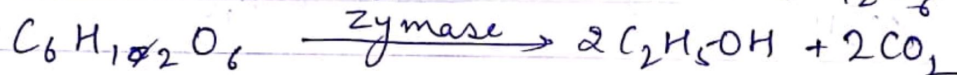
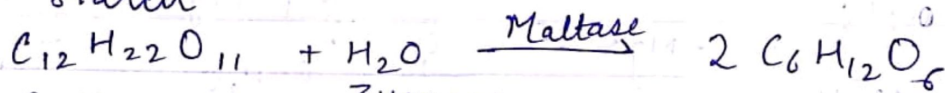
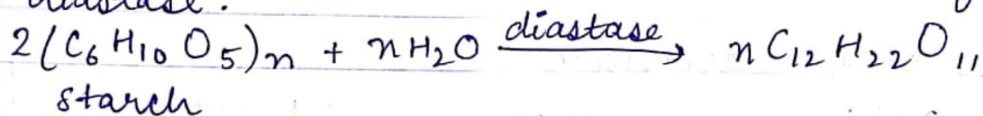
Fermentation is carried out in - nce of oxygen becoz in air it convert ethanol into ethanoic acid & it becomes sour.

Invertase } Yeast
Zymase }
Maltase }

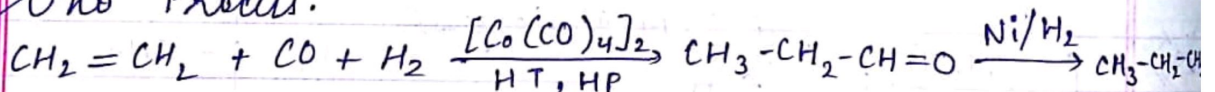
Diastase enzyme from
malt
↓
germinated Barley

② From starch Material :-

Ethanol is also obtained from starch substance like rice, Potatoes, Barley with enzyme of diastase.

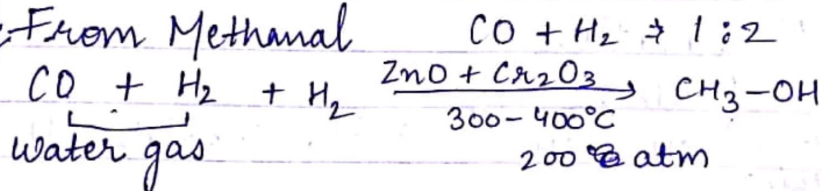


Not gmf Oxo Process.



Not gmf

From Methanol



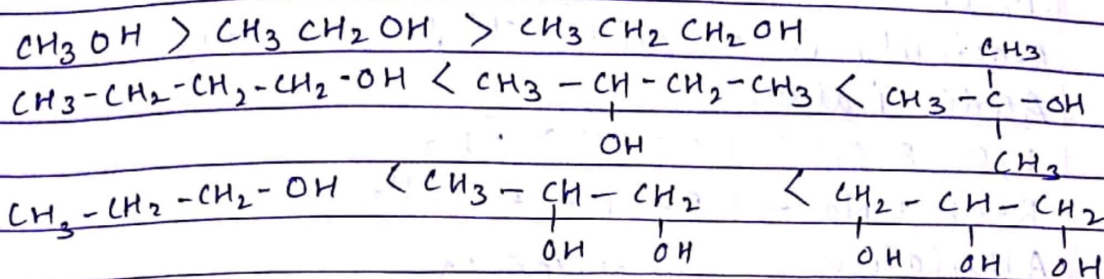
Physical Property

① State $C_1-C_{11} \rightarrow$ liq colourless
higher $\rightarrow$ solid

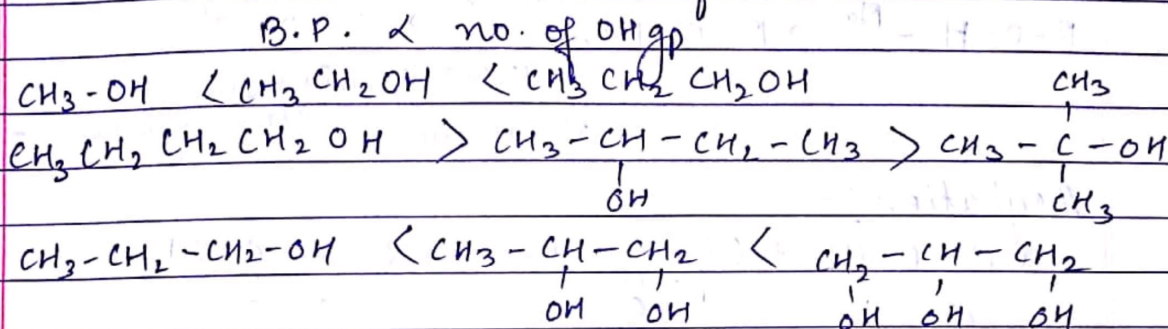
② Density $\rightarrow d_{R-OH} < d_{H_2O}$

③ Solubility $< \frac{1}{M_w}$ $\propto$ no. of side chain
(isomers) $3^\circ > 2^\circ > 1^\circ$

→ Solubility $\propto$ no. of OH gr
OH gr $\uparrow$ H-bonding $\uparrow$ S $\uparrow$
with H_2O

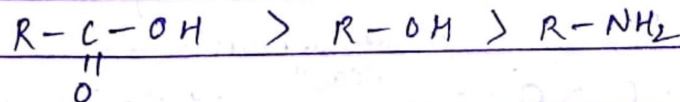


→ B.P. : B.P. $\propto$ M.W. $\propto$ no. of side chain



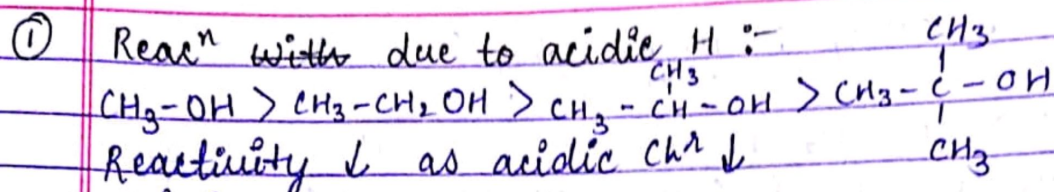
→ B.P. $R-OH > R-O-R$
 $\uparrow$ H-bonding

→ B.P. of alcohol is more than amines but less than acids

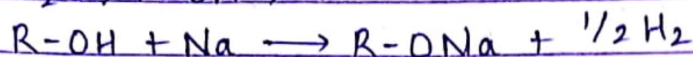
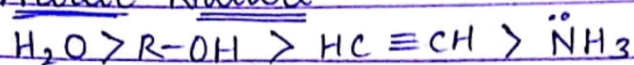


Chemical Properties :-

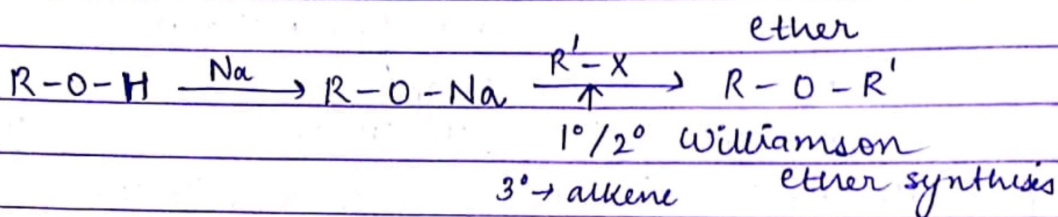
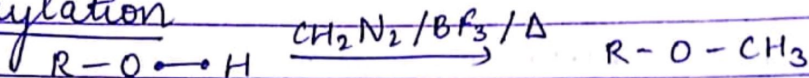
1. Reacⁿ due to acidic H ($O+H$)
2. Reacⁿ due to cleavage of $R-OH$ Bond
3. Reacⁿ due to alcohol gr.



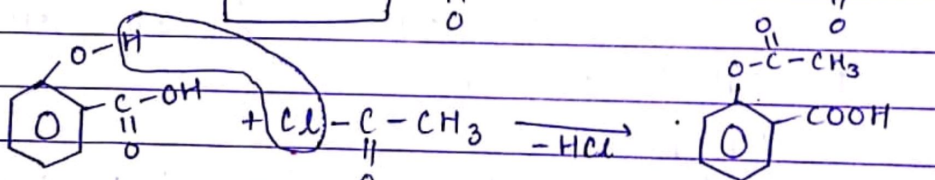
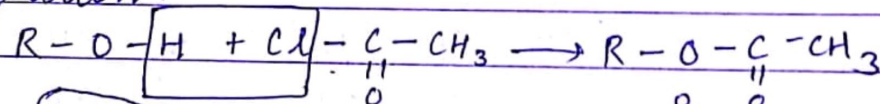
Acidic Nature



Alkylation

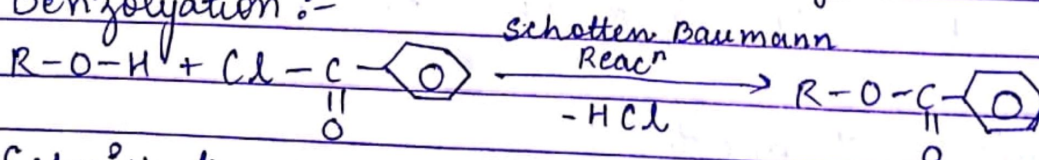


Acylation :-

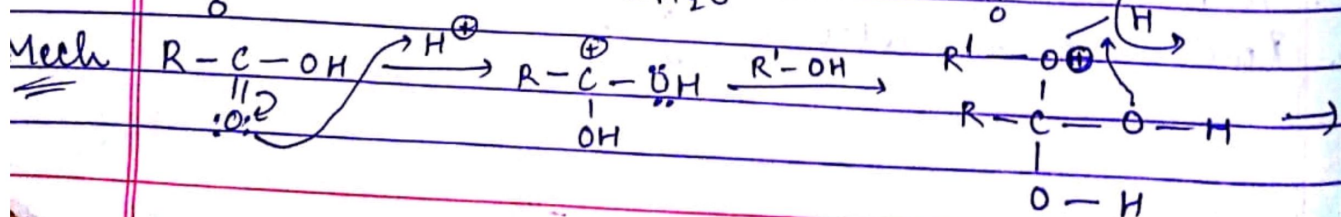
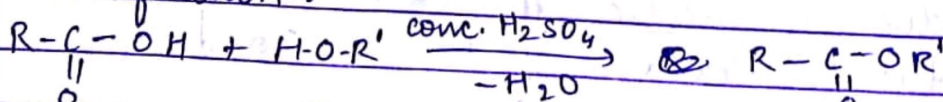


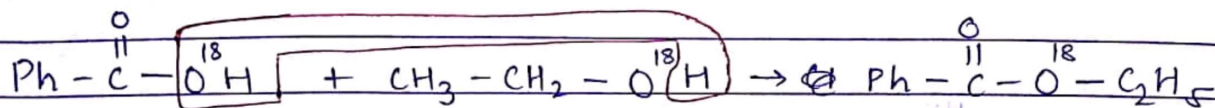
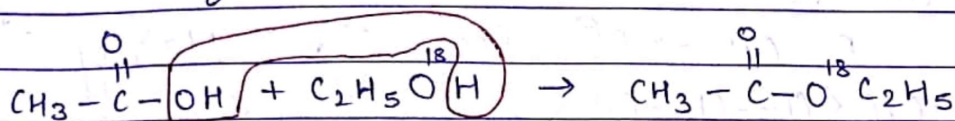
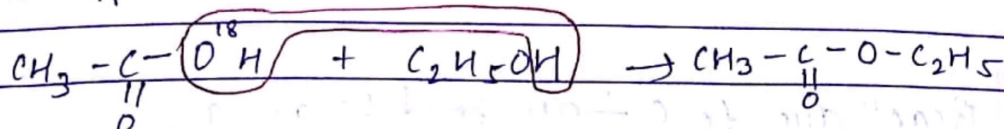
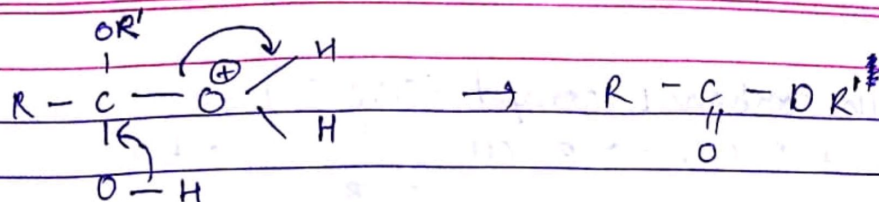
Aspirin
(Anti Pyretic)

Benzoylation :-



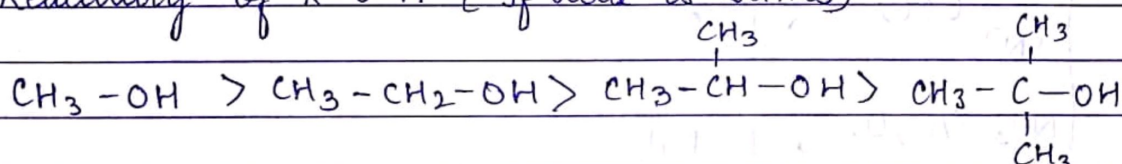
Esterification :



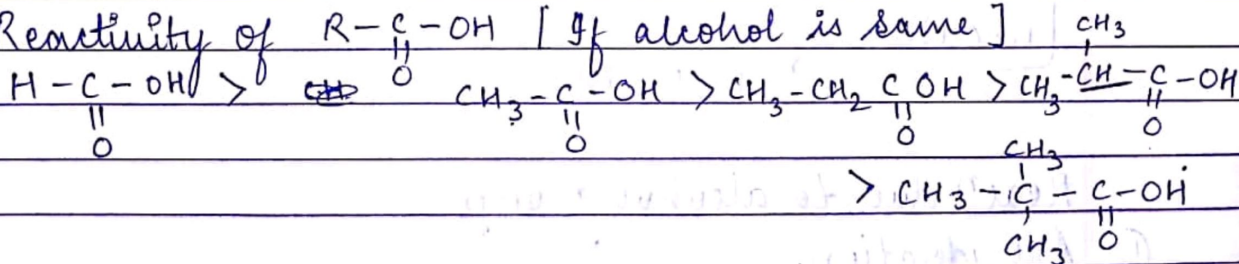


Rate of esterification $\propto \frac{1}{\text{Steric hinderance}}$

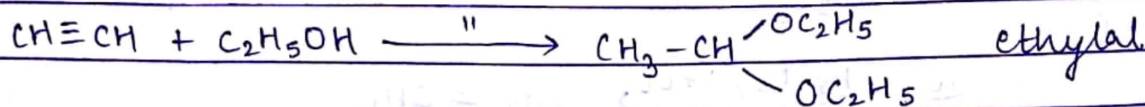
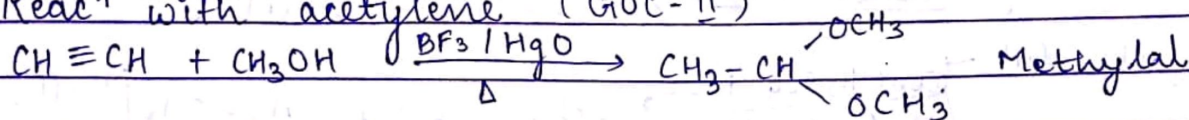
Reactivity of R-O-H [If acid is same]



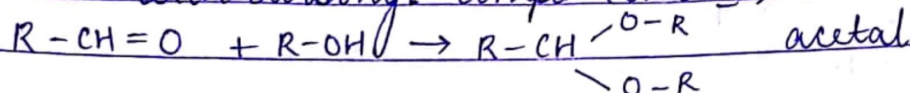
Reactivity of R-C(=O)-OH [If alcohol is same]



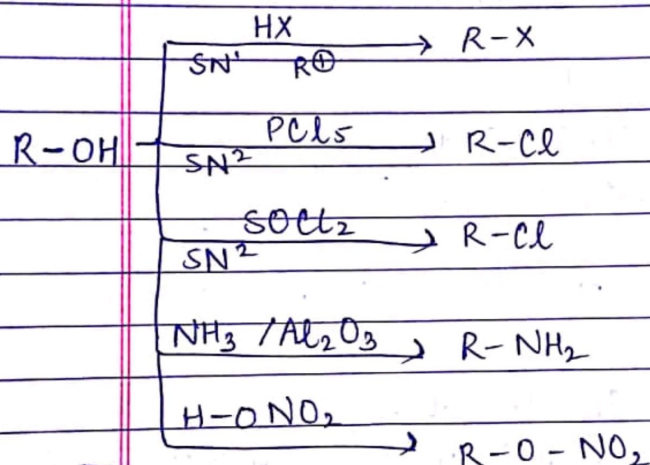
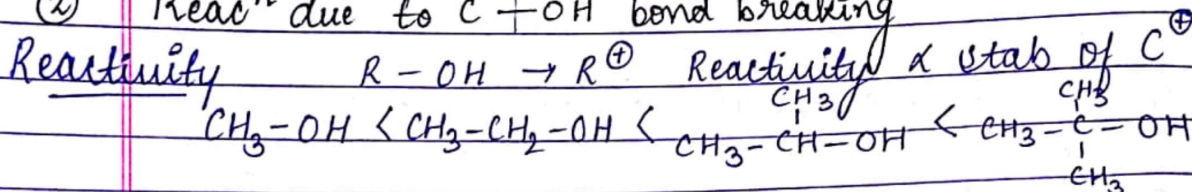
Reacⁿ with acetylene (GOC-II)



Reacⁿ with carbonyl compd (GOC-II)

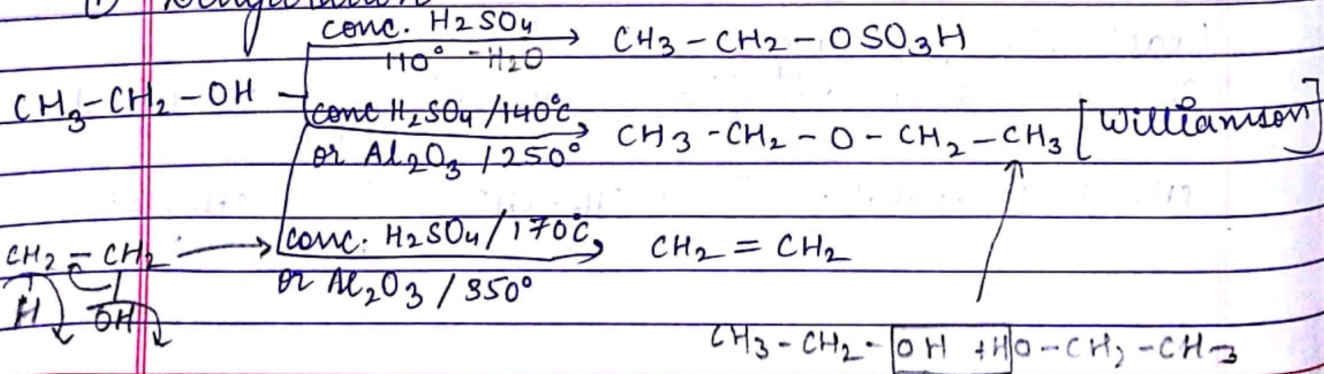


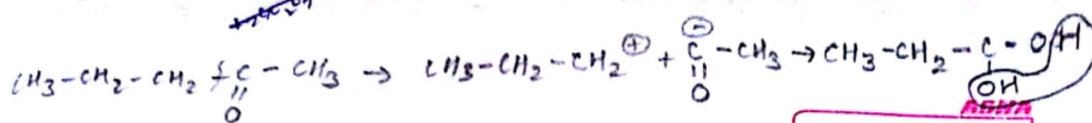
② Reacⁿ due to C-OH bond breaking



Reacⁿ due to alcohol group :-

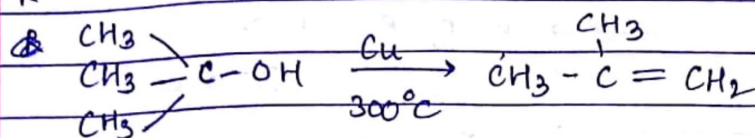
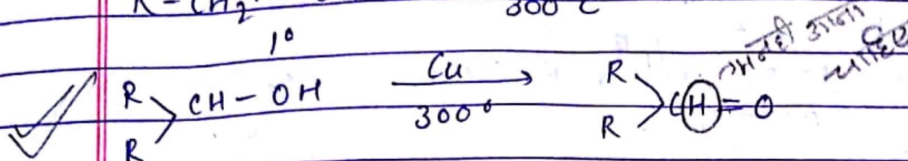
① Dehydration



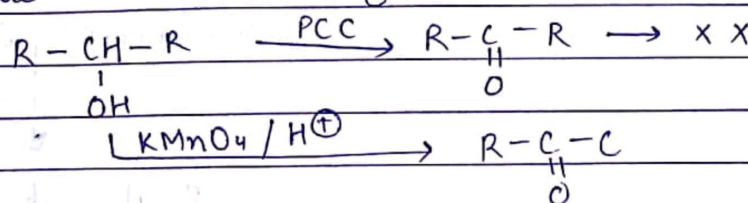
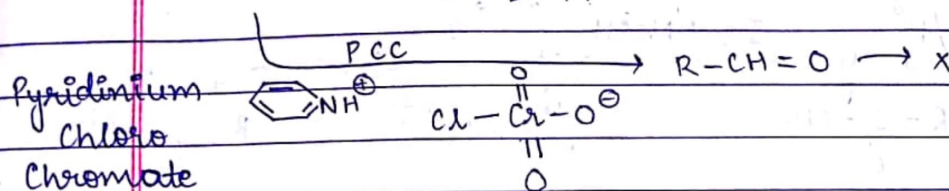
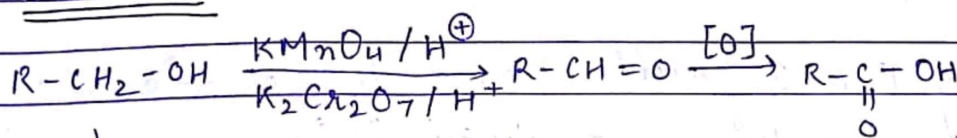


Date _____ Page _____

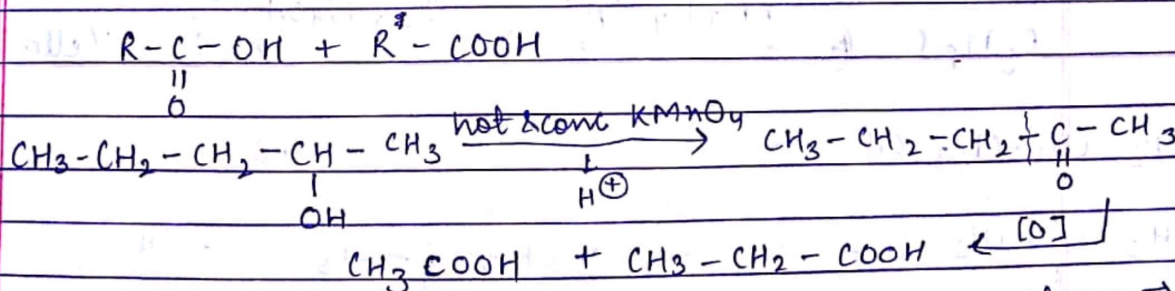
② Catalytic Dehydrogenation :-
 $\text{R}-\text{CH}_2-\text{OH} \xrightarrow[300^\circ\text{C}]{\text{Cu}} \text{R}-\text{CH}=\text{O}$



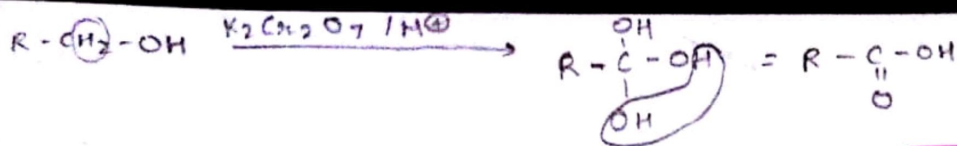
Oxidation :-



High Temp or. $\downarrow$ normal Temp $\downarrow$
 hot & conc KMnO_4



Breaking bond takes place from bigger alkyl gp $\rightarrow$
Popoff's Rule

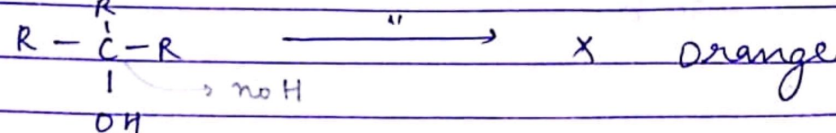
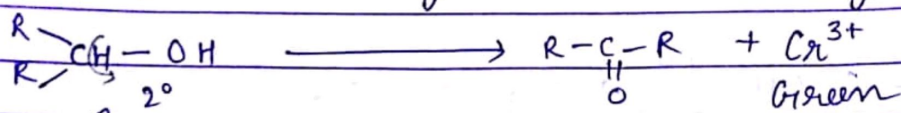
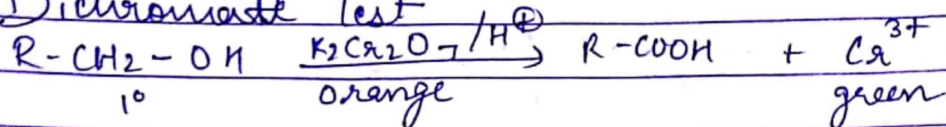


ASHA
Date _____ Page _____

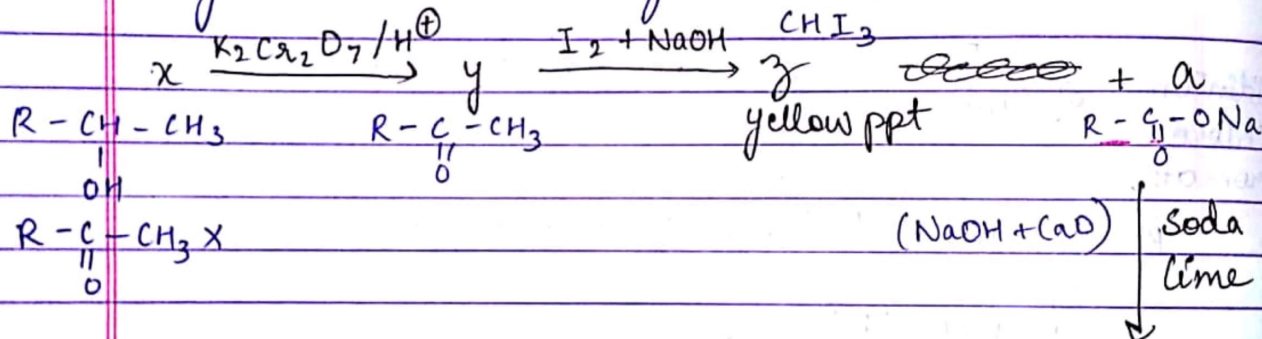
Test of Alcohol:-

1. Luca's Reagent

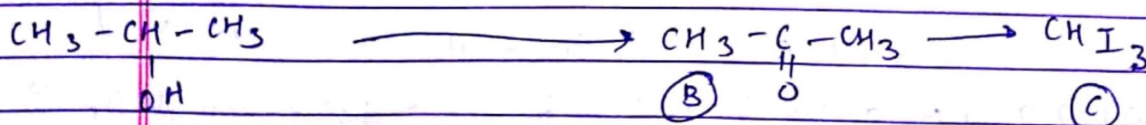
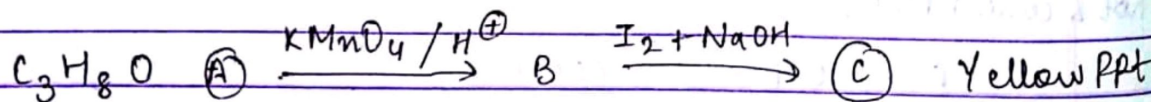
2. Dichromate Test



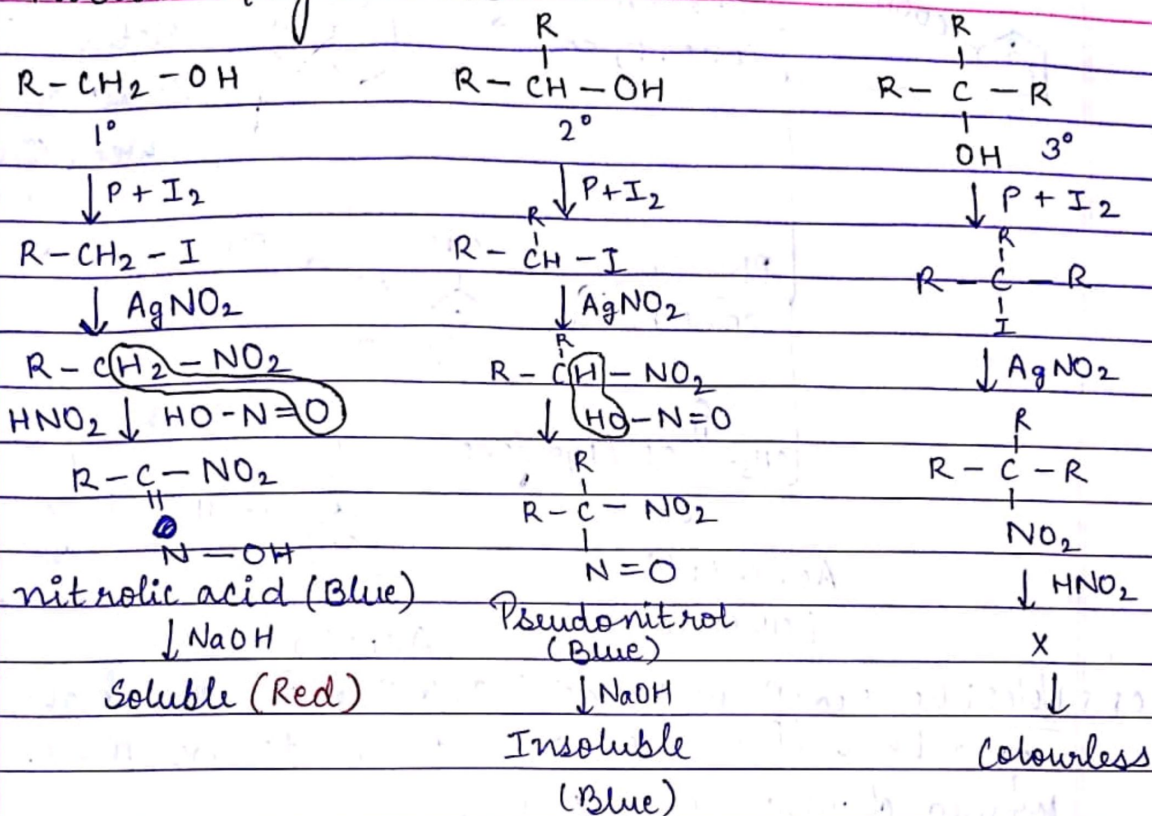
Only 1° & 2° alcohol give dichromate Test



$$M_w = 30 \quad V.D. = 15$$

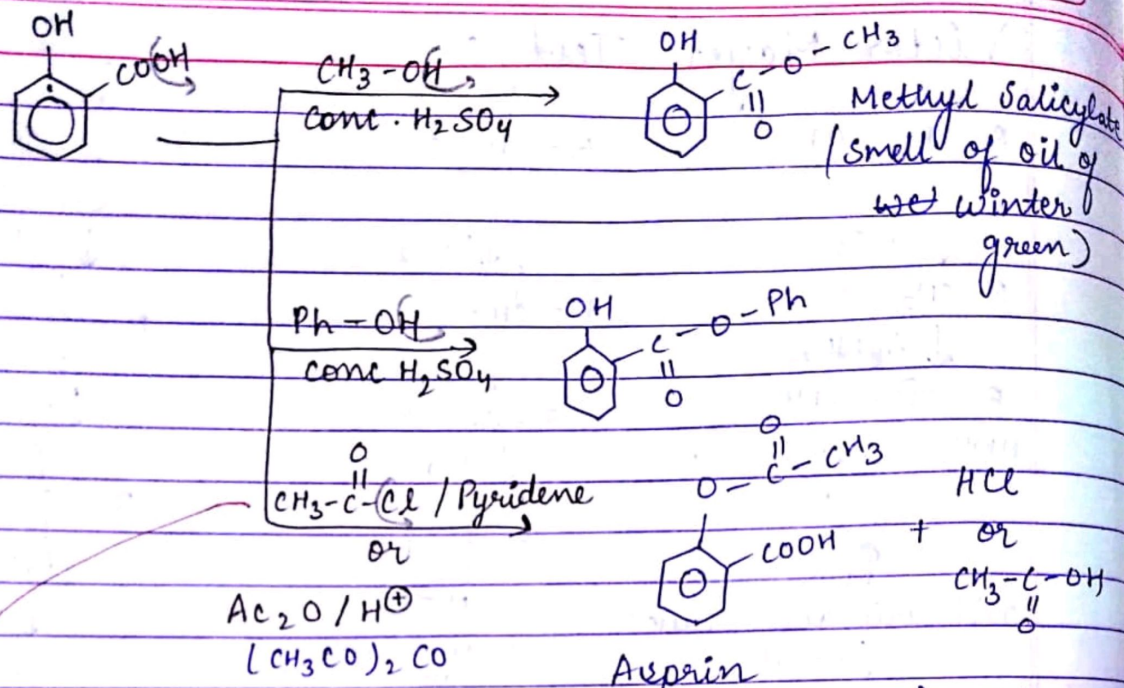


Victor Mayer Test :-



R B C
1° 2° 3°

Distinction b/w	CH ₃ -OH & CH ₃ OH	C ₂ H ₅ OH
B.P.	65°C	78°C
I ₂ + NaOH	no ppt	yellow ppt
Cu / 300° C	smell of formalin $H-\overset{\overset{O}{ }}{C}-H$	no smell
Salicylic acid	smell like oil of winter green.	no smell



NCERT Note: The reacⁿ with acid chloride is carried out in the presence of a base (Pyridine) so as to neutralise HCl which is formed during the reacⁿ.

Phenolic :-

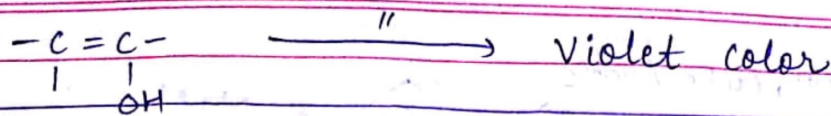
$\text{C}_{\text{sp}^3} - \text{OH}$
alcoholic

$\text{C}_{\text{sp}^2} - \text{OH}$
Phenolic

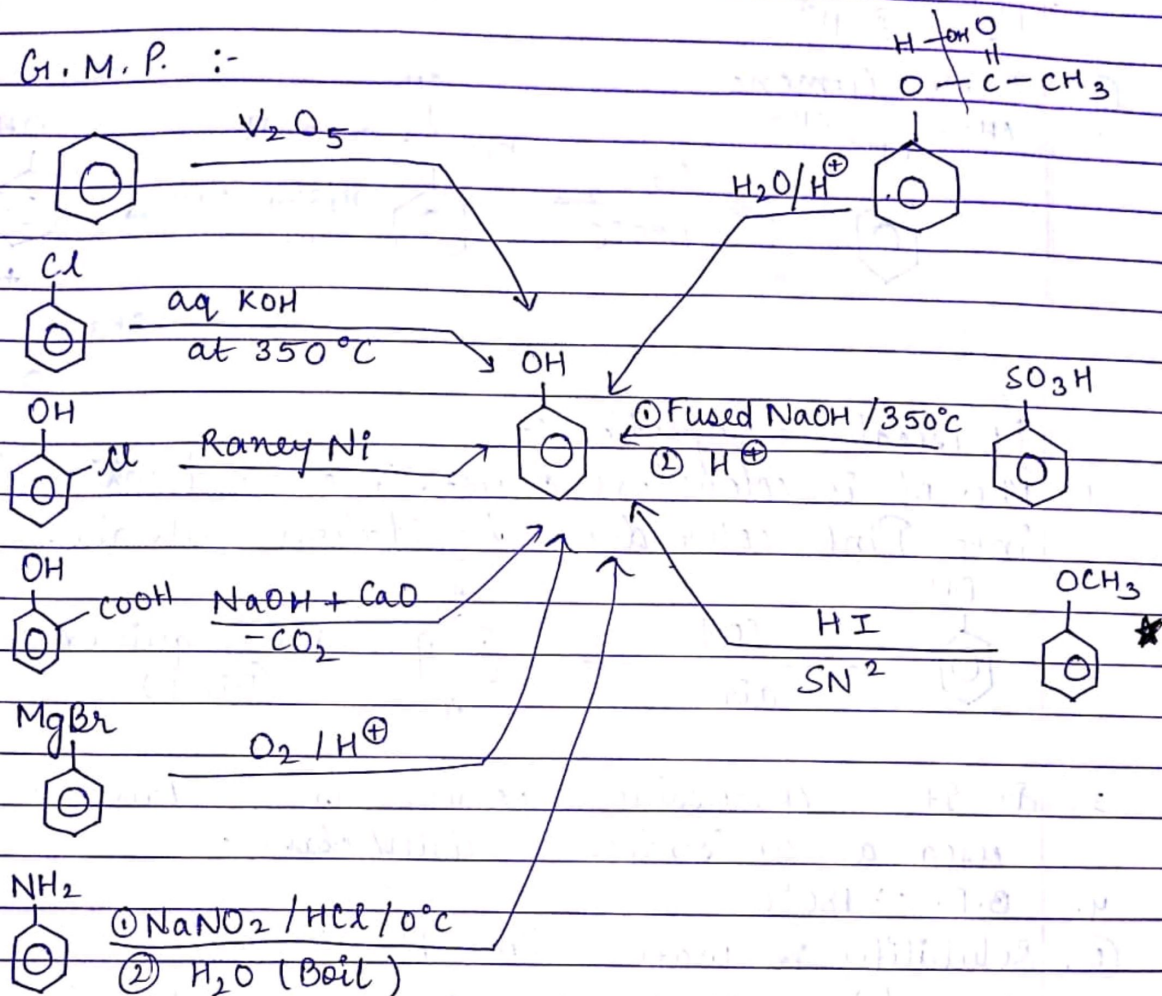
Test of Phenol

$\text{R-CH}_2\text{-OH} \xrightarrow{\text{FeCl}_3}$ no color
Alcohol

Oc1ccccc1
 $\xrightarrow{\text{FeCl}_3}$ Violet color

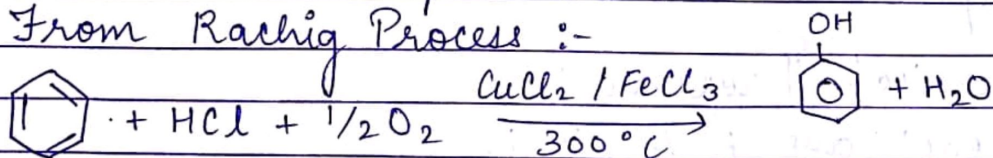


G.M.P. :-

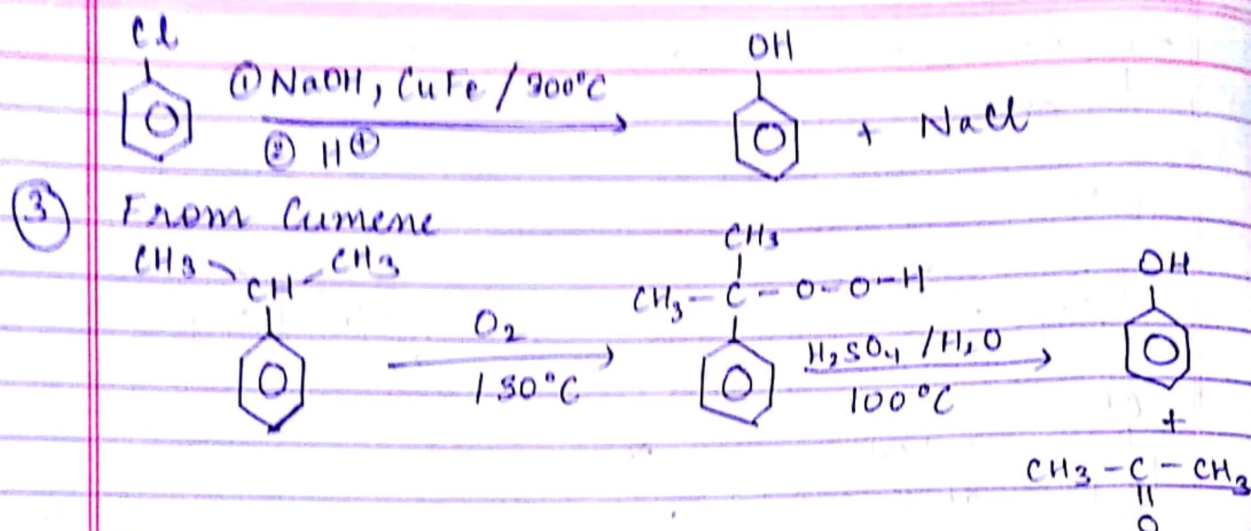


Industrial Preparation :-

① From Raschig Process :-

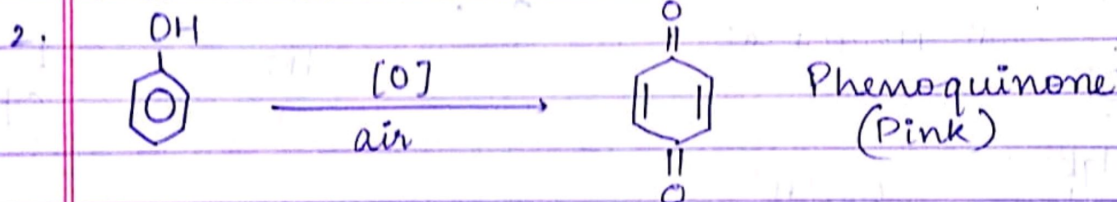


② Dow Process :-



Physical Properties :-

1. Phenol is colourless crystalline solid which changes into Pink color due to oxidation with air.



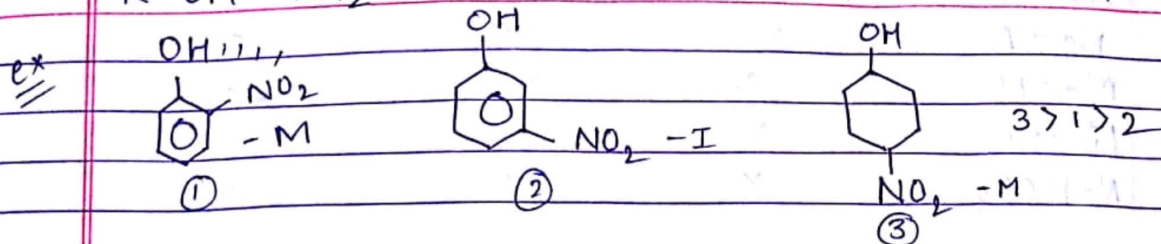
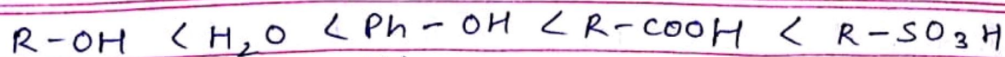
3. It is corrosive & poisonous substance but used as antiseptic & disinfectant.

4. B.P. $\rightarrow 180^\circ\text{C}$

(5) Solubility in water $\text{Ph-OH} < \text{R-OH}$
due to +ve of large phenyl gp which is water repellent.

Chemical Properties :-

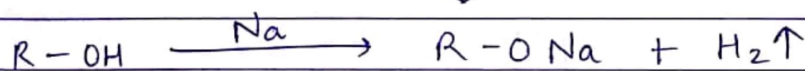
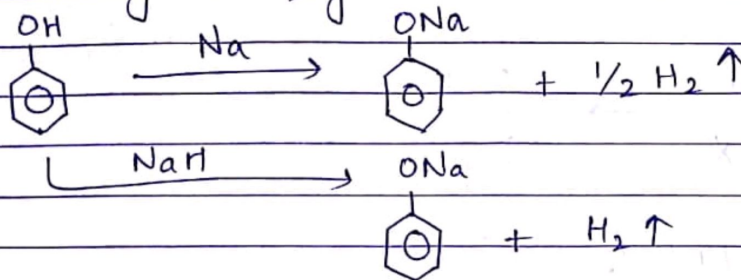
(1) Reacⁿ due to Acidic H :-
Acid strength $\propto \frac{-M/-I}{+M/+I}$



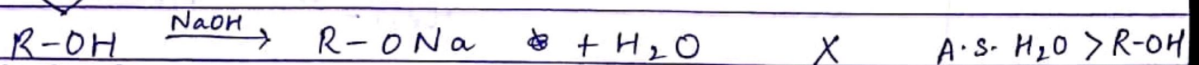
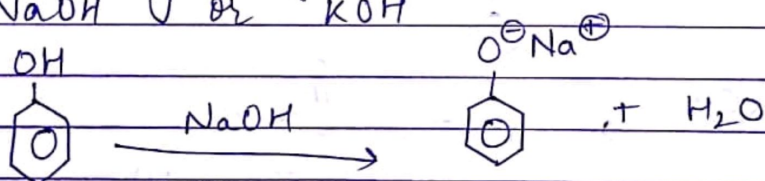
Acidic Nature

Phenol turn blue litmus to Red.

Phenol give H_2 gas with metals & metal hydride

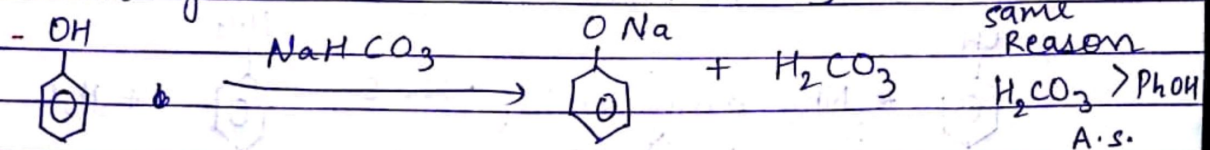


Phenol give Phenoxide ion with alkalis like NaOH or KOH



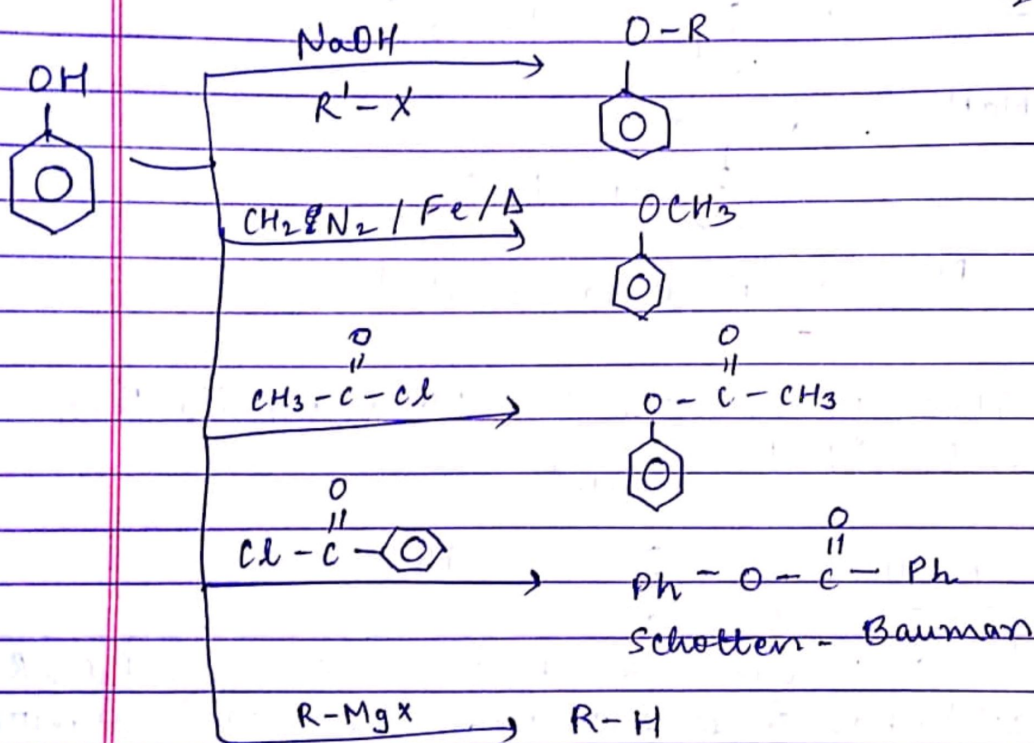
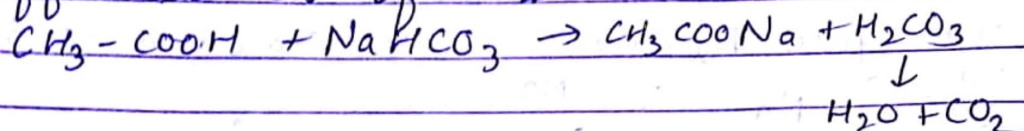
जोई भी acid, base के साथ React करेके अपने से ज्यादा Acidic sub. नहीं देगा ।

Phenol give -ve test with $NaHCO_3$

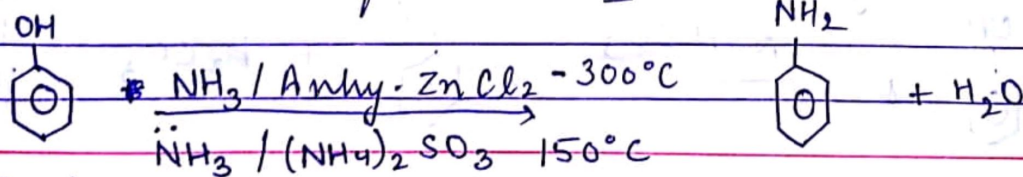


Test with	R-OH	Ph-OH	R-COOH
Na / Δ	✓	✓	✓
NaOH	X	✓	✓
Litmus	X	✓	✓
NaHCO ₃	X	X	✓

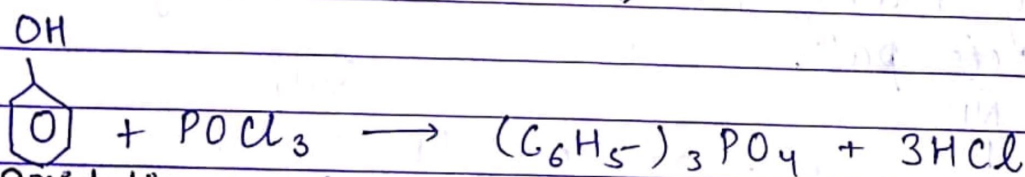
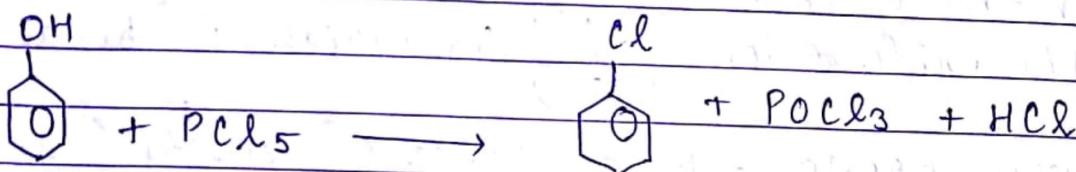
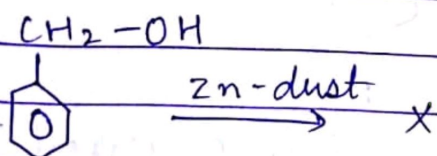
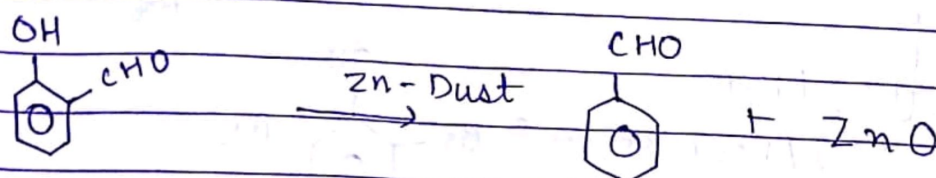
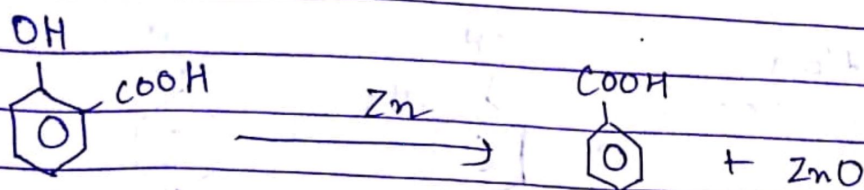
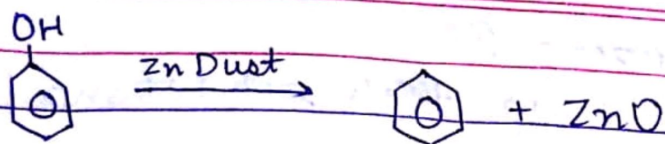
Acetic Acid react with NaHCO₃ & give effervescences of CO₂



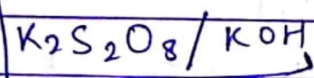
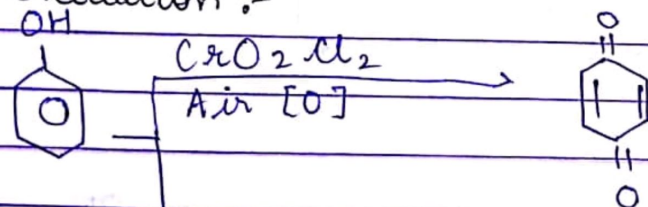
ESR : Reviser from Glac-II



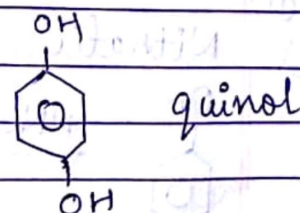
Bucherer Reaction



Oxidation :-

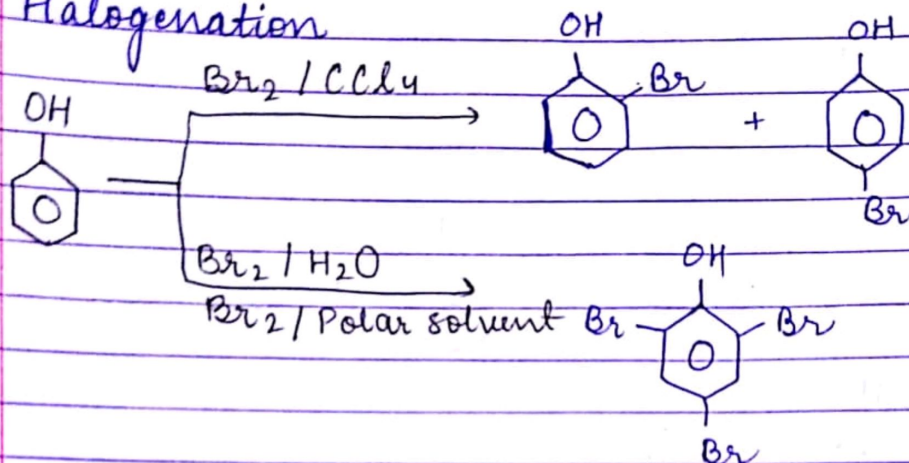


Elb's Persulphate reaction



Reacⁿ due to benzene Ring :-
Since Phenol has -OH gp which act +M and it o/p director.

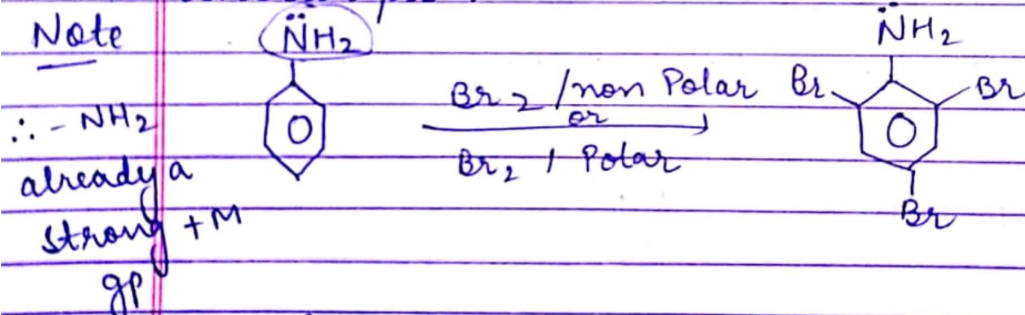
① Halogenation



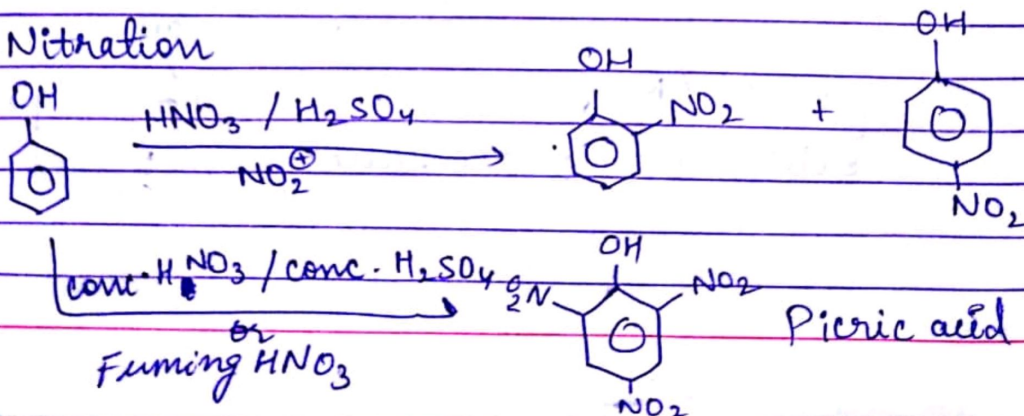
In +ve of Polar solvent Phenol is converted into Phenoxide ion ($\text{C}_6\text{H}_5\text{O}^-$) in which O^- behave as

very strong +M gp hence e^- density $\uparrow$ at o/p director posⁿ.

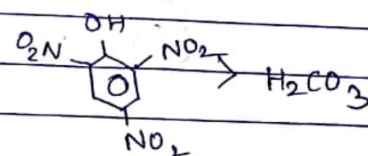
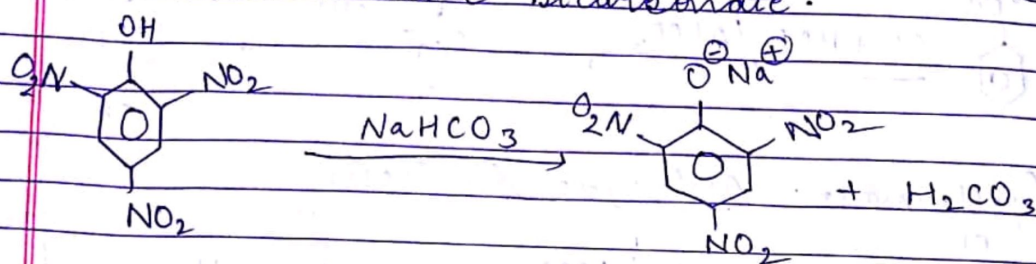
Note



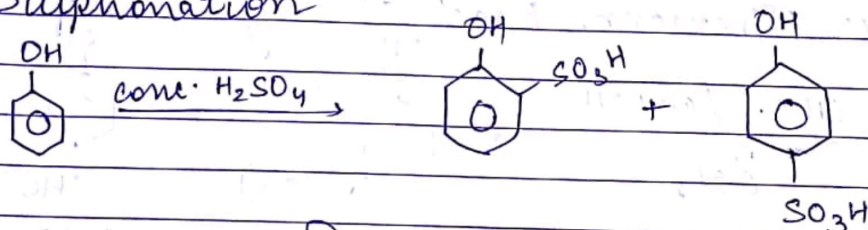
② Nitration



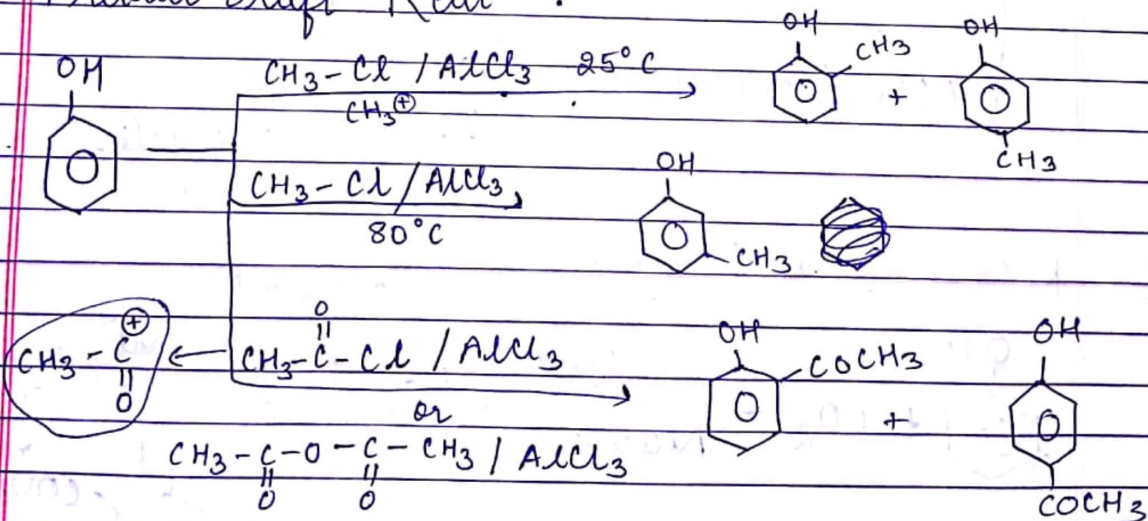
Note Picric acid is only Phenolic substance which give +ve test with sodium bicarbonate.



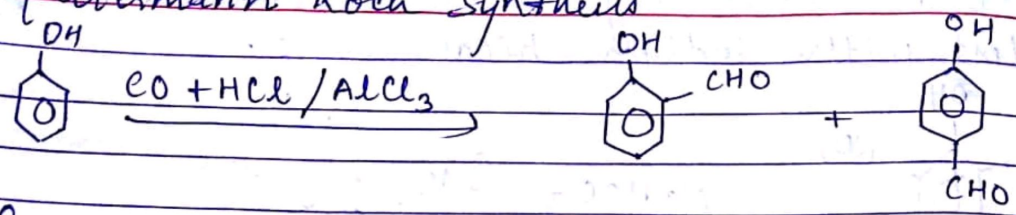
Suphonation



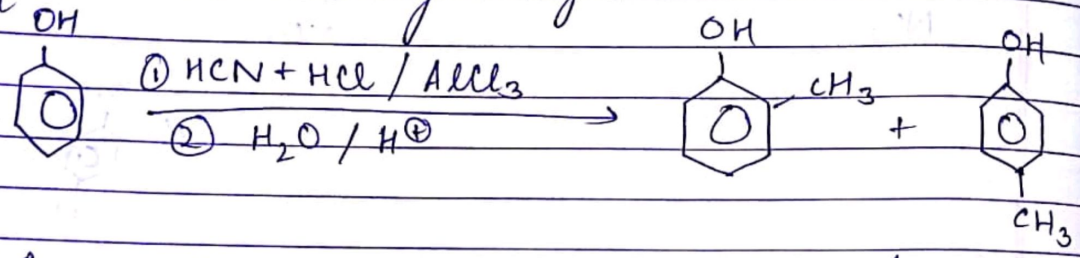
Freidel craft Reacⁿ :-



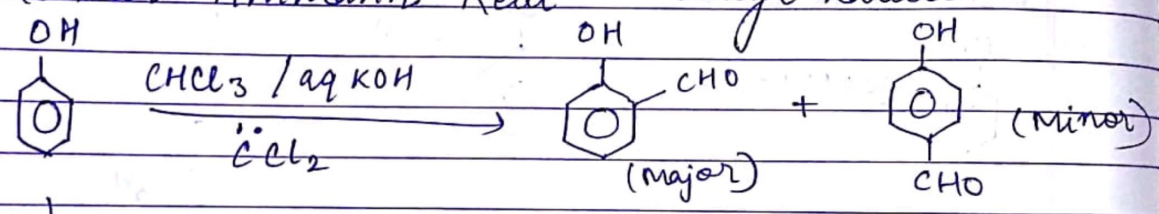
Gattermann Koch synthesis



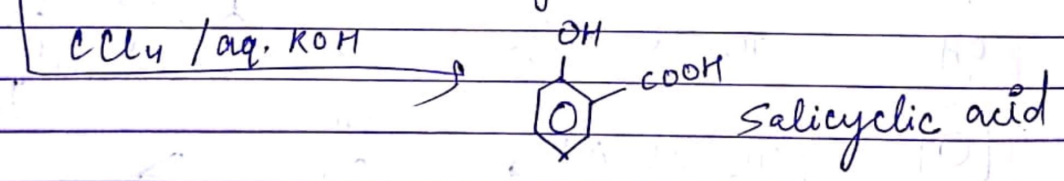
Gattermann Aldehyde Synthesis



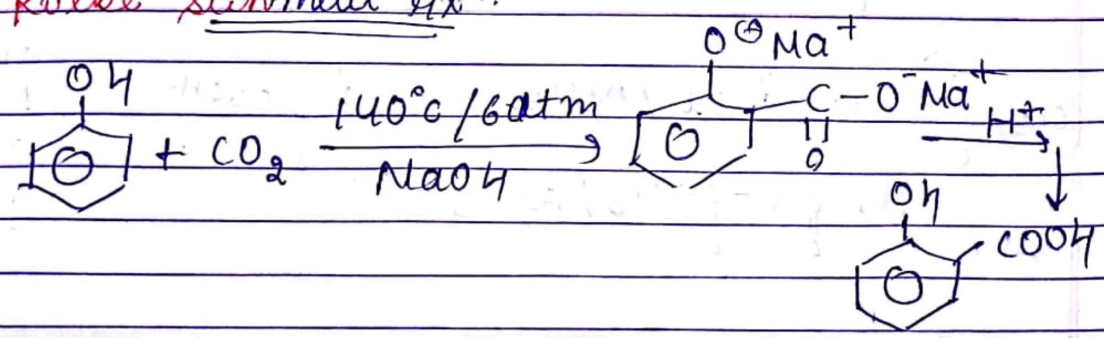
Reimer Timmann Reacⁿ → alkyl halide



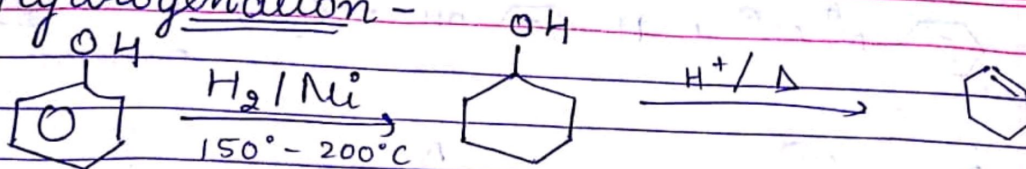
High Temp. P isomer major.



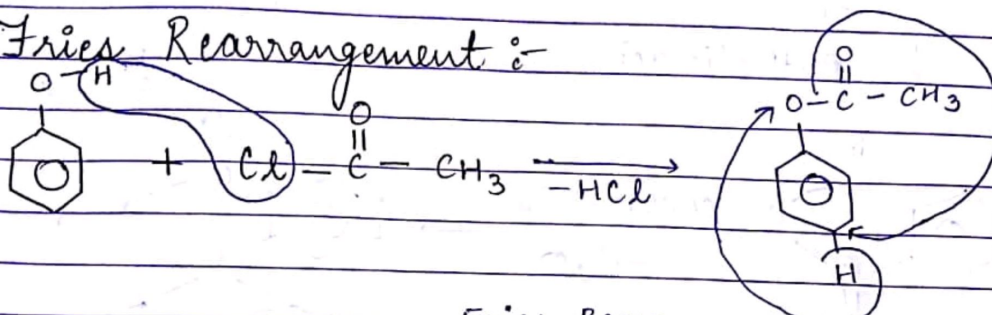
(7) Kolbe schmidt exⁿ.



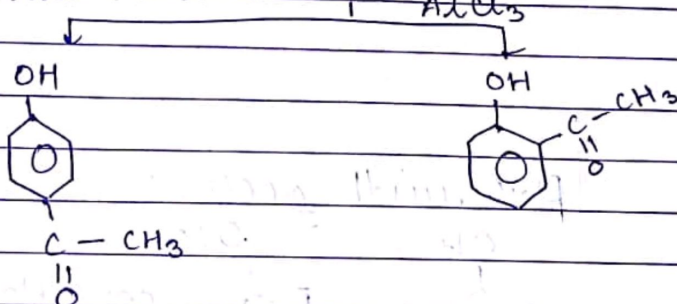
(8) Hydrogenation -



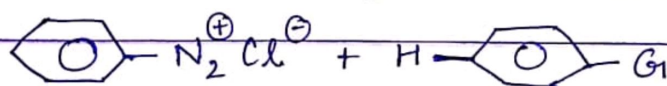
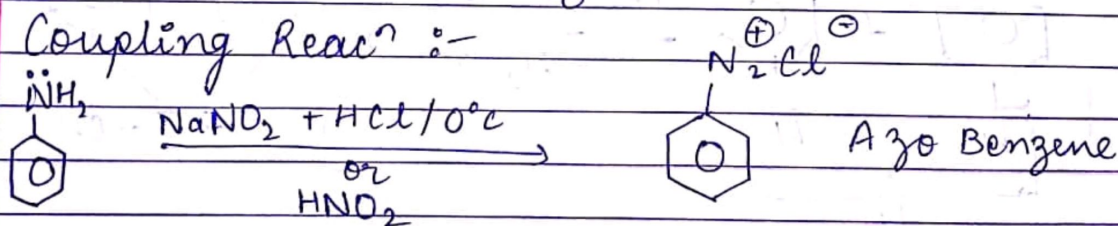
Fries Rearrangement :-



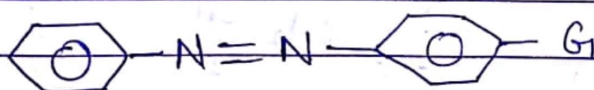
Fries Rearr.



Coupling Reacⁿ :-



↓ coupling



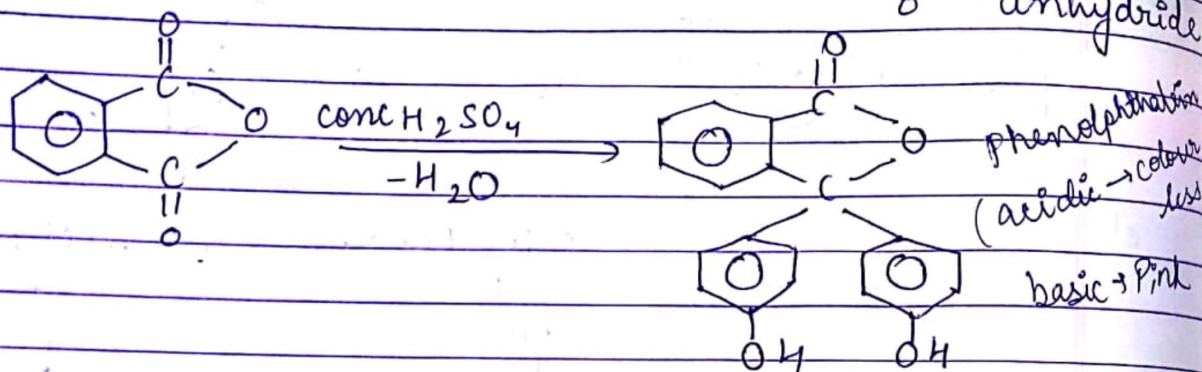
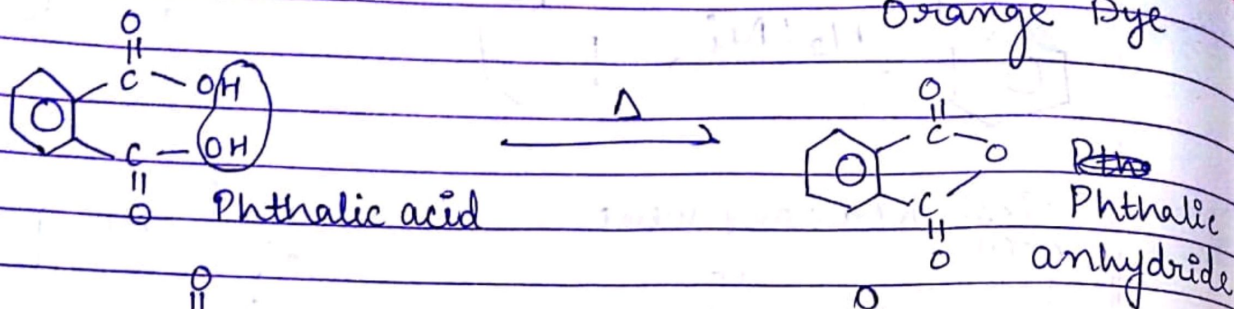
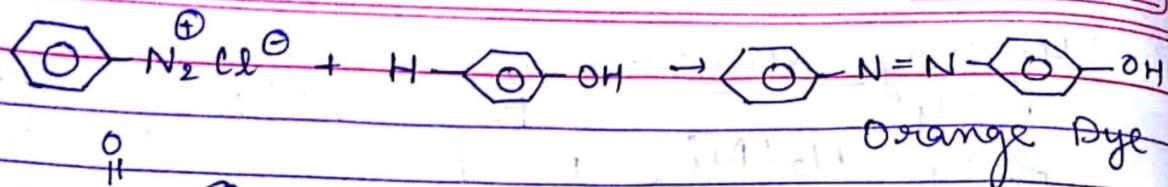
G₁ → -OH

-OR

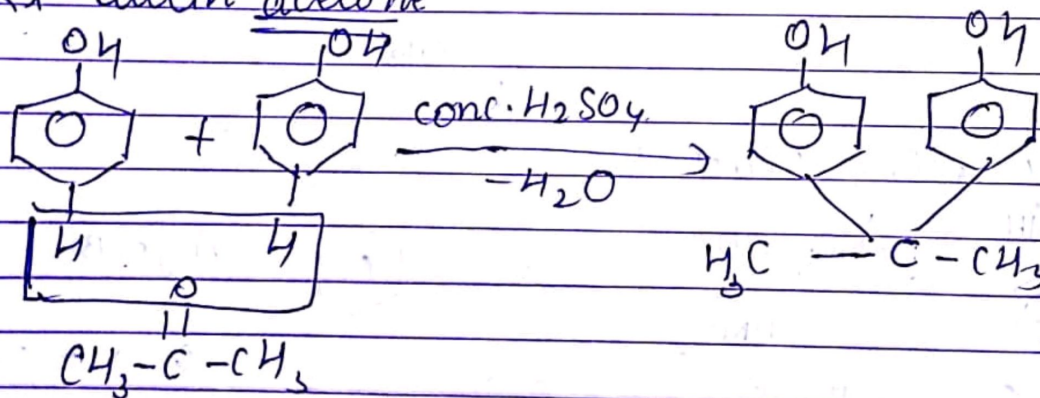
→ NH₂

-NH-R

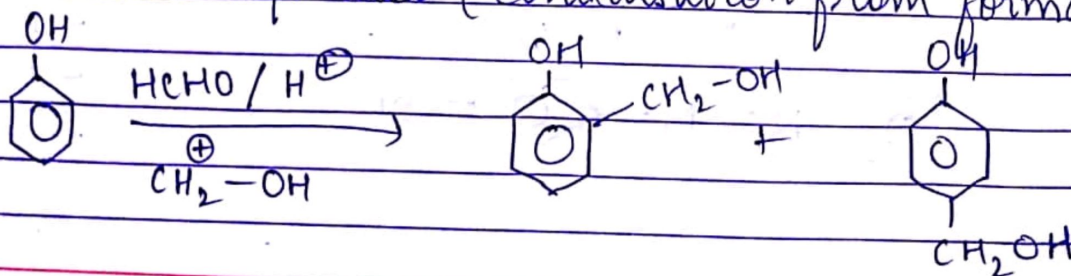
-N $\begin{matrix} \nearrow R \\ \searrow R \end{matrix}$



Rxn with acetone -

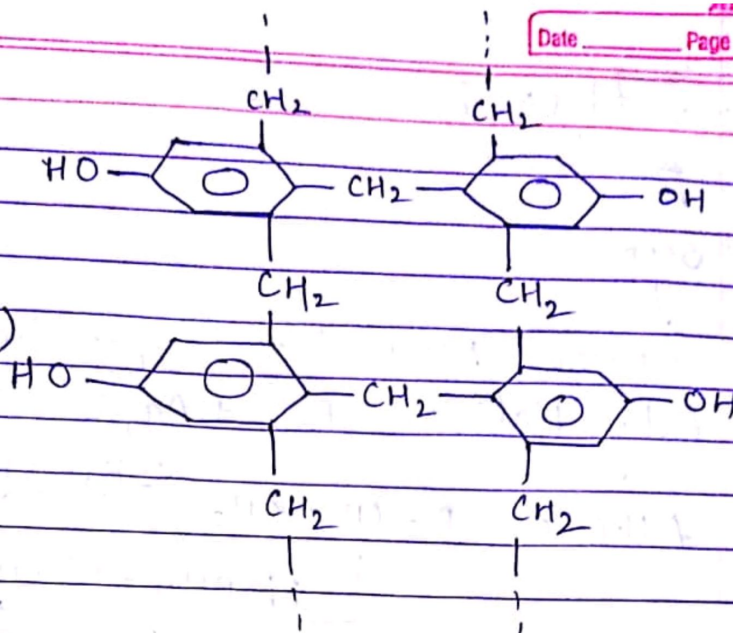


Lederer Manase (Condensation from formaldehyde)



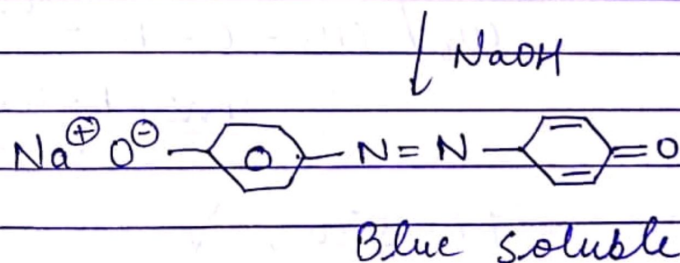
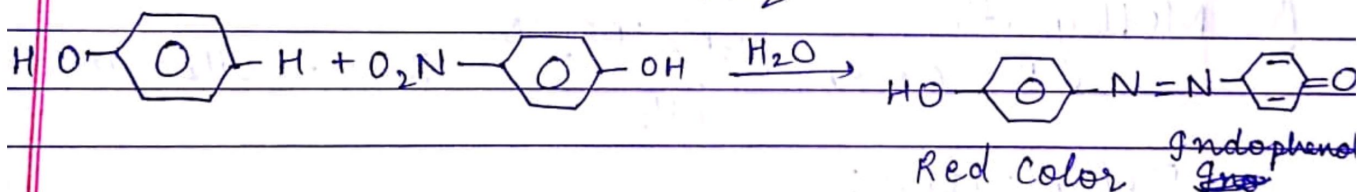
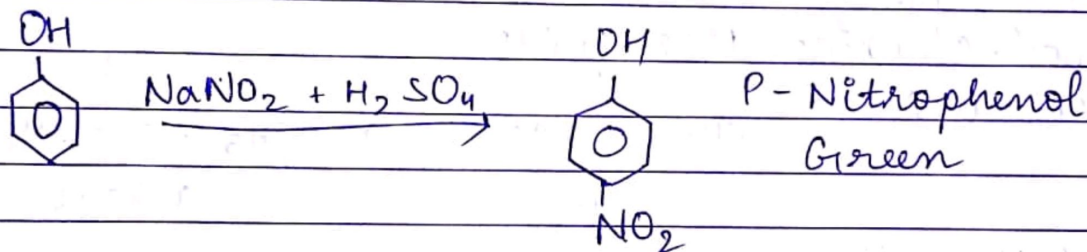
Polymerisation

Bakelite
(Phenol
Formaldehyde)
resin

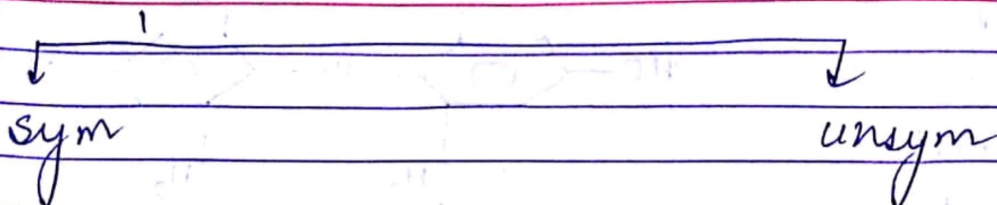


Liebermann Nitroso Test :-

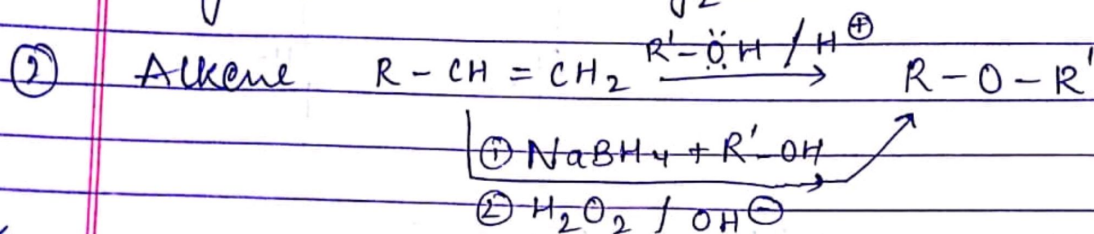
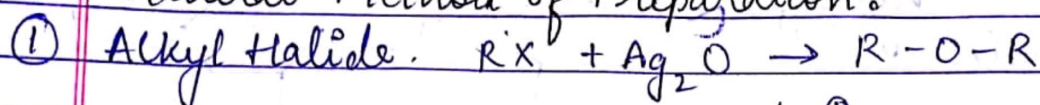
Phenol $\xrightarrow{\text{NaNO}_2 + \text{H}_2\text{SO}_4}$ Green Color $\xrightarrow{\text{H}_2\text{O}}$ Red colour $\xrightarrow{\text{NaOH}}$ Blue



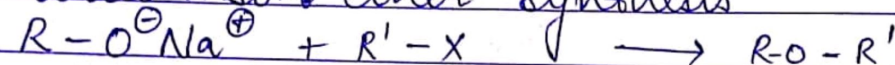
Ether :-



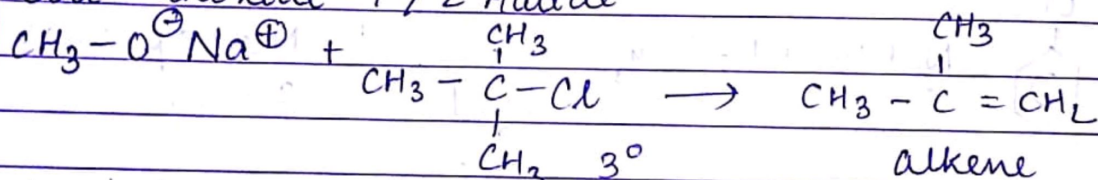
General Method of Preparation :-



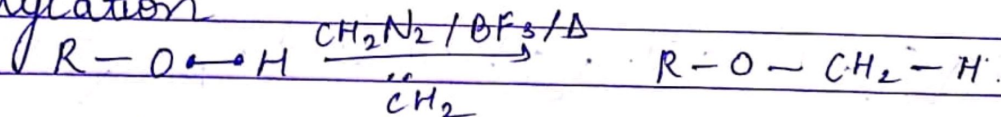
* ③ Williamson's ether synthesis



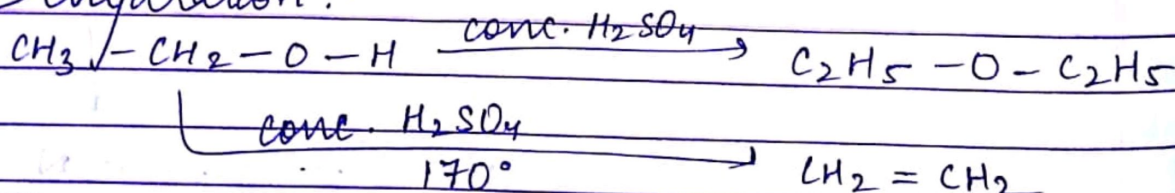
sod. alkoxide $1^\circ/2^\circ$ Halide



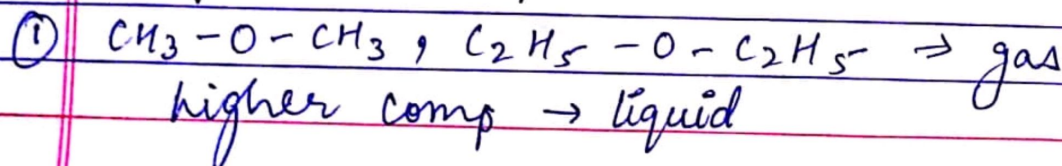
④ Methylation



Dehydration :-



Physical Properties :-



- ② B.P. of ether is less than alcohol $\because$ H-bonding is +nt in alcohol
- ③ Ethers are less polar.
- ④ solubility : Ethers are less polar in water becoz they have Polarity

Chemical Properties: SN^2 GOC-II