

Ether

$R-O-R \rightarrow$ simple ether

$R'-O-R \rightarrow$ mixed ether

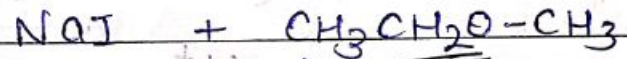
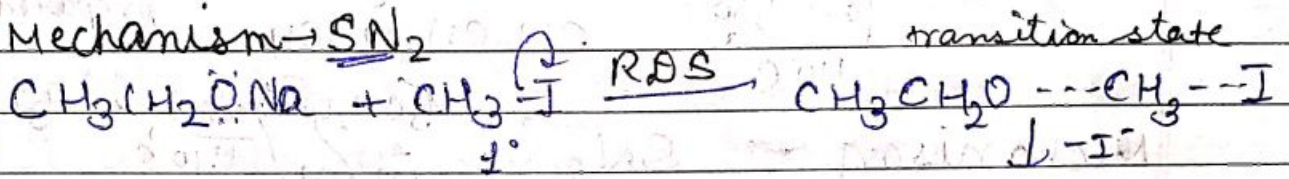
Ethers show functional isomerism with alcohol. It also shows chain isomerism & metamorphism.

Preparation of ether \rightarrow

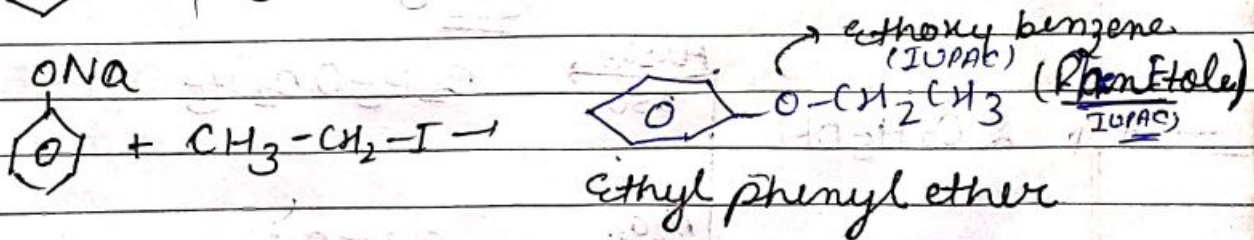
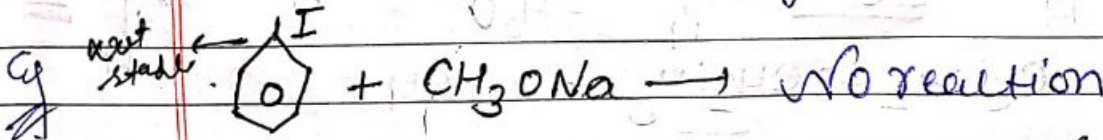
Williamson ether synthesis \rightarrow



Mechanism \rightarrow S_N2

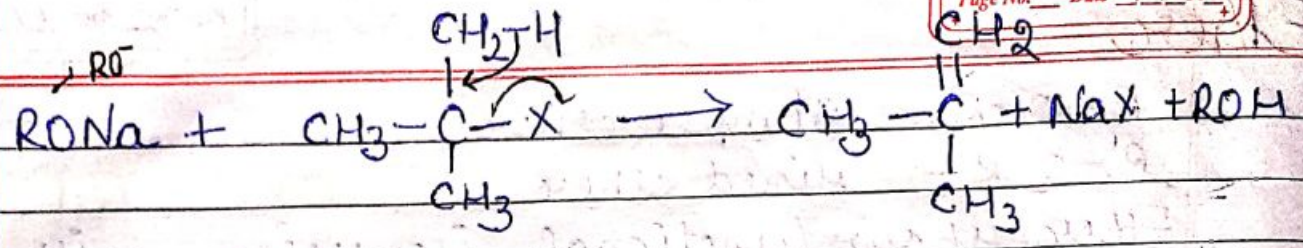


- \rightarrow S_N2 Mechanism (only primary alkyl halide) Inversion
- \rightarrow No carbocation should be formed
- \rightarrow Inversion product should be obtained
- \rightarrow Best method for preparation of ether because all type of ether symmetrical or unsymmetrical can be formed

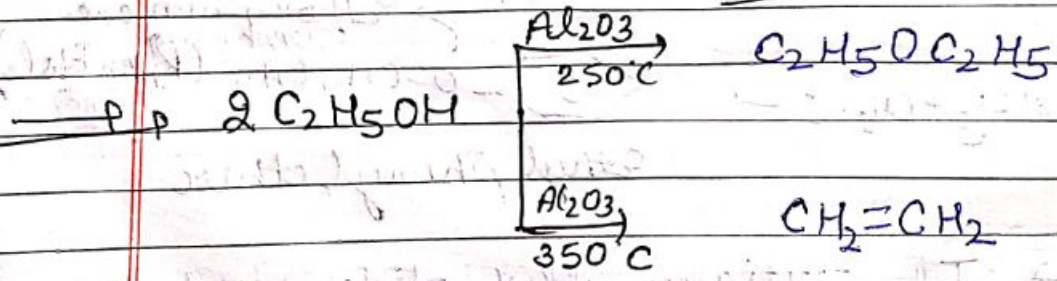
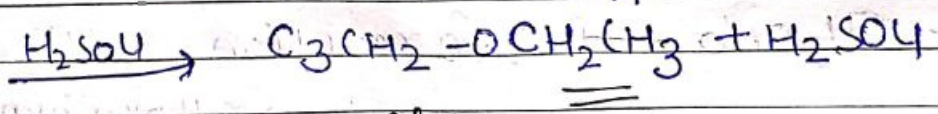
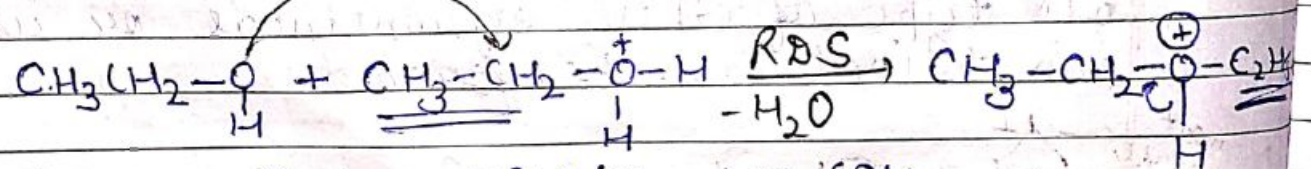
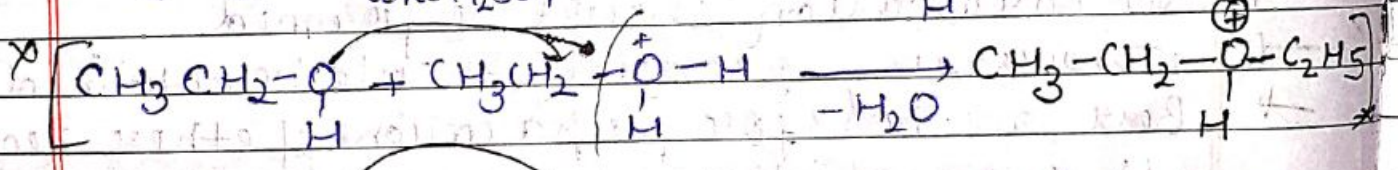
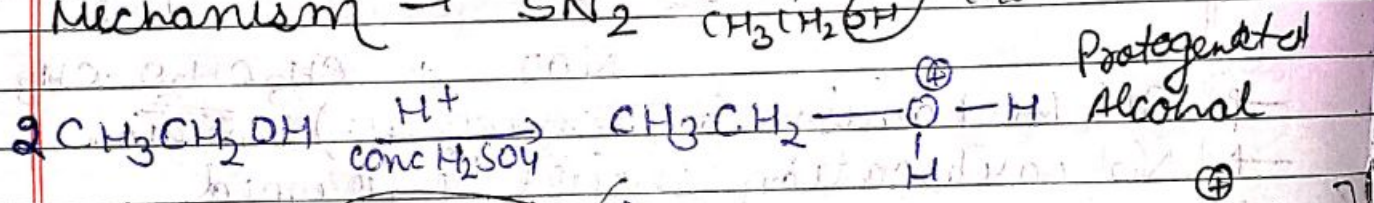
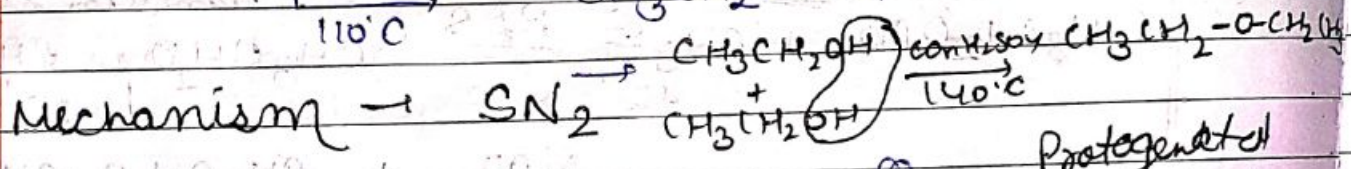
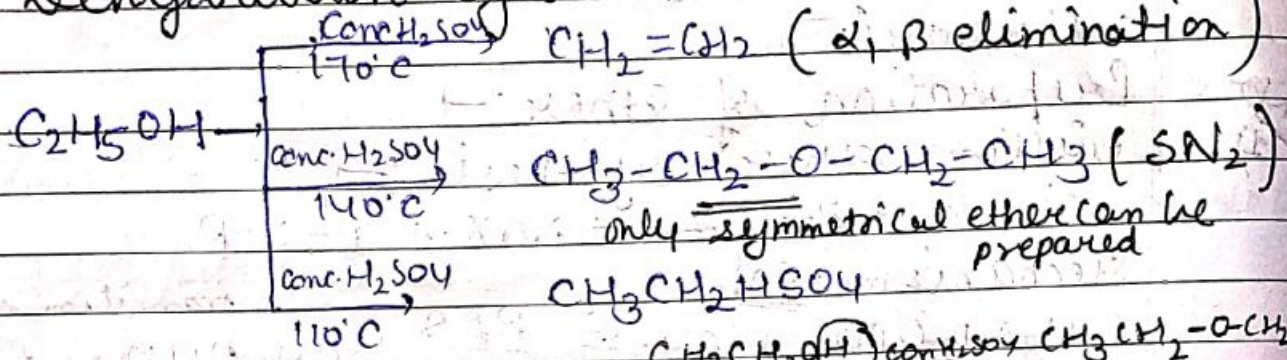


Imp. Note \rightarrow If tertiary alkyl halide used then alkene should be formed that is no williamson rxn, No S_N2 Mechanism that is elimination rxn.

Lewis base \rightarrow Alcohol (ethanol) & Ether

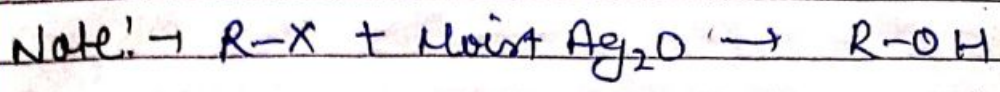
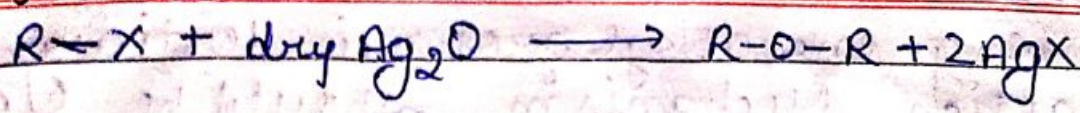


2) Dehydration of alcohol :- $CH_2=CH_2$ (α, β elimination)



$CH_3OH > C_2H_5OH > C_3H_7OH$
 Reactivity of different 1° alcohol for dehydration of alcohol at 140°C in presence of conc. H₂SO₄

3) From silver oxide :->



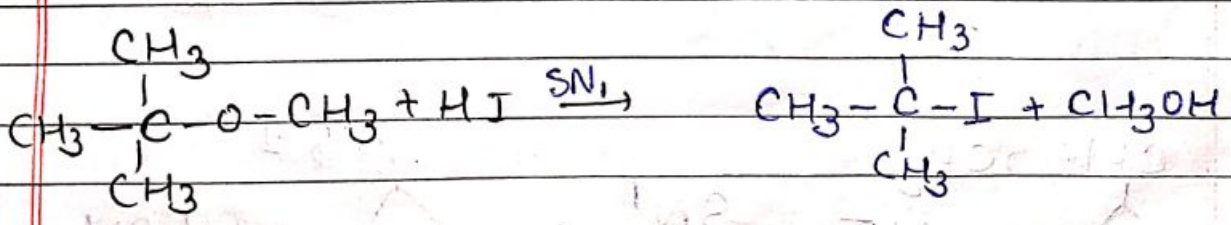
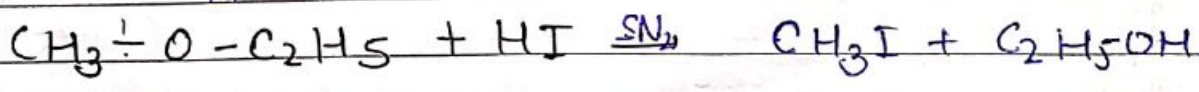
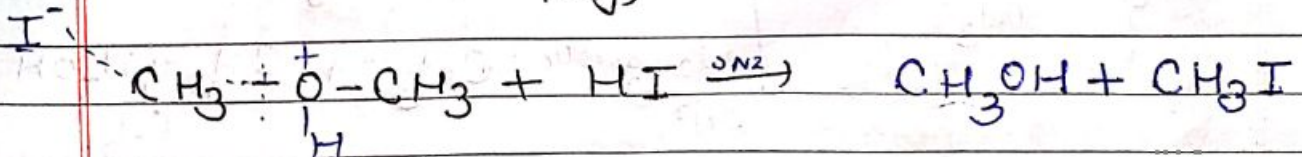
*1 Physical properties :->

1) solubility -> Initially 3 ethers are soluble in water due to H-bond. Higher ether are soluble in organic solvent.

2) Boiling point -> $C_2H_5OH > CH_3-O-CH_3$
It is due to ethanol having stronger intermolecular H-bond as compare to ether.

*1 chemical Properties :->

1) Reaction with HI (Highly reducing agent)
 $CH_3-O-CH_3 + HI \xrightarrow[\text{(limited supply)}]{\text{Normal cold}}$ $CH_3I + CH_3OH$



case-1 If both alkyl group (1) in ether molecule is same then reaction carried out according to SN₂ Mechanism

Case-2

If any one alkyl group is tertiary then reaction Mechanism should be SN_1

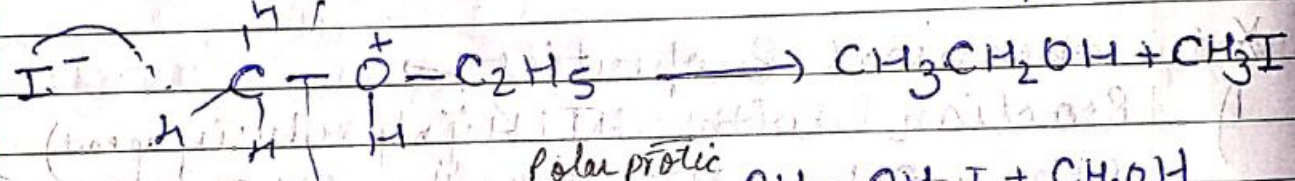
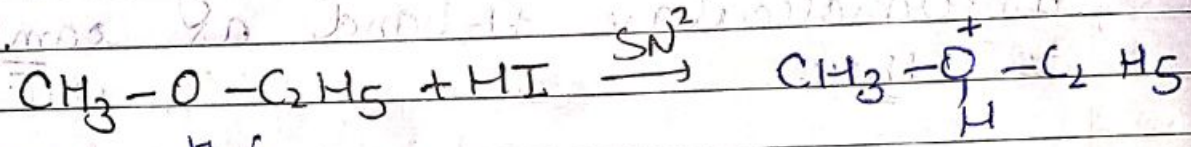
Case-3

If any alkyl group is secondary then reaction mechanism depends on nature of solvent.

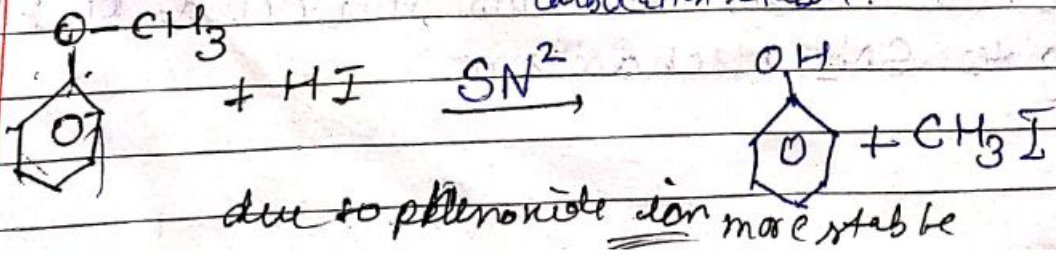
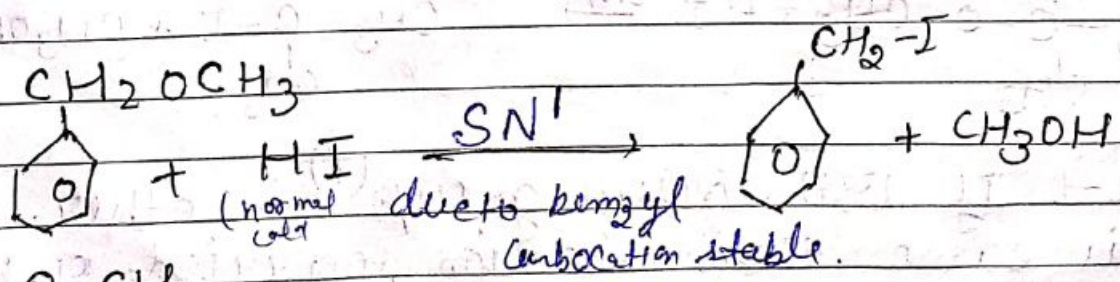
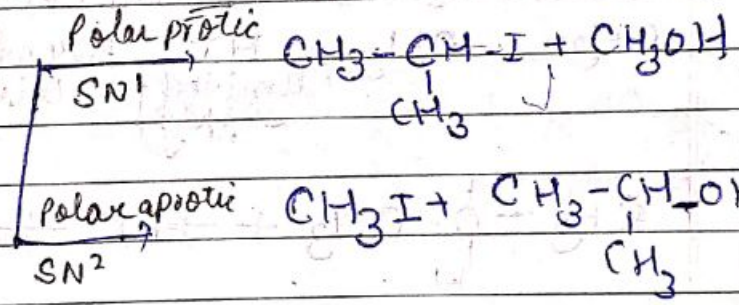
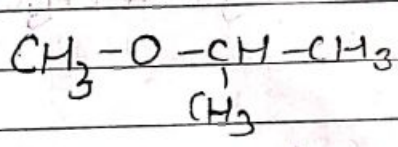
polar protic solvent $\rightarrow SN_1$
(water, ethanol etc)

polar aprotic solvent $\rightarrow SN_2$
(CH_3COCH_3 , ether, DMSO)

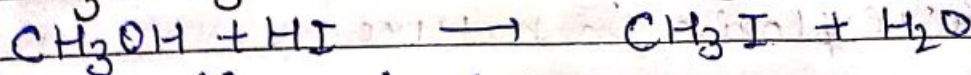
Case-1



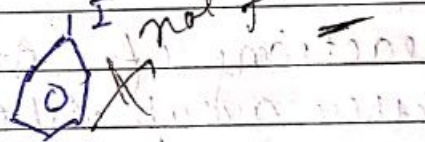
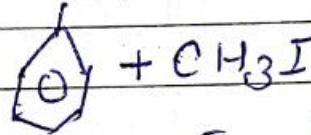
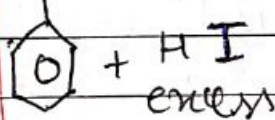
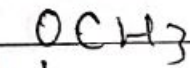
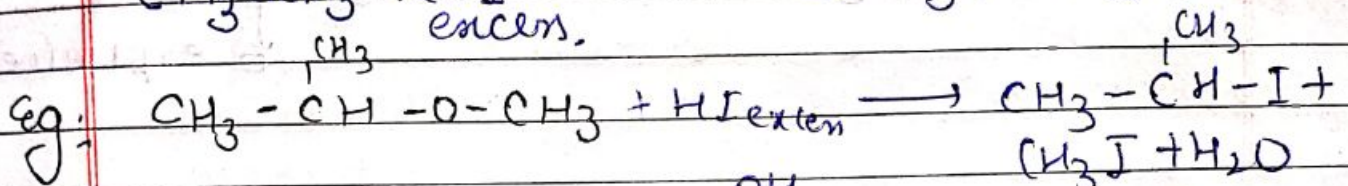
Case-2



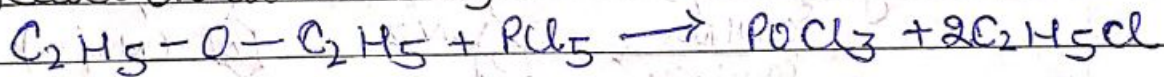
2) Reaction with excess HI (hot, excess)



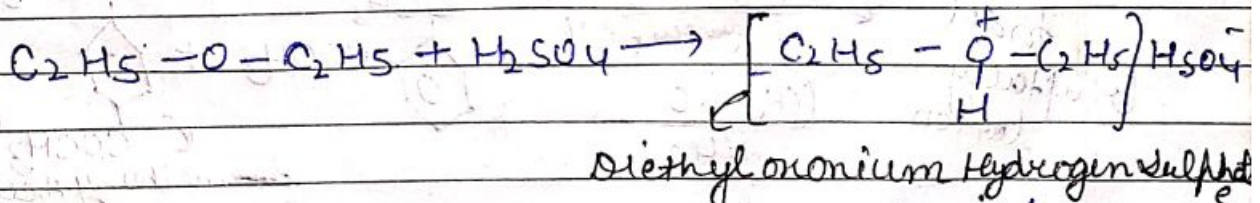
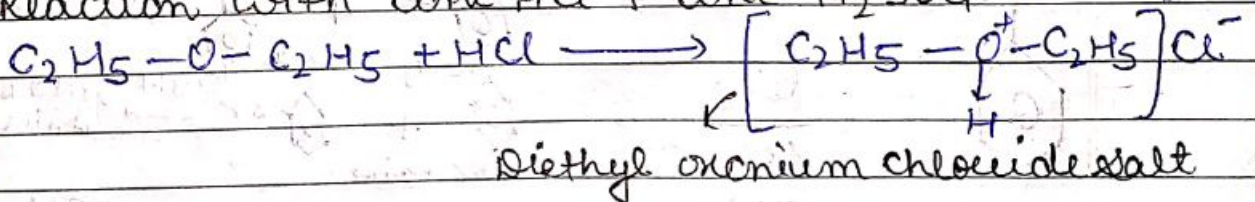
Overall net rxn



3) Reaction with PCl_5



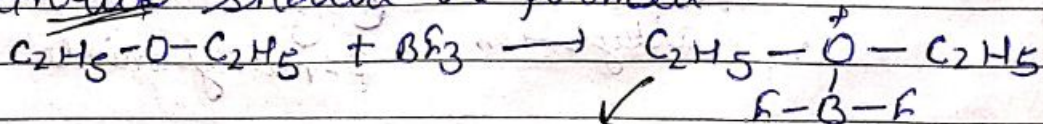
4) Reaction with conc. HCl & conc. H_2SO_4



This reaction shows ether act as Lewis base

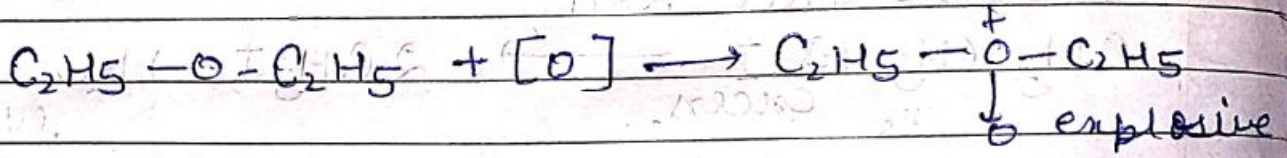
5) Reaction with BF_3

Ethylate should be formed



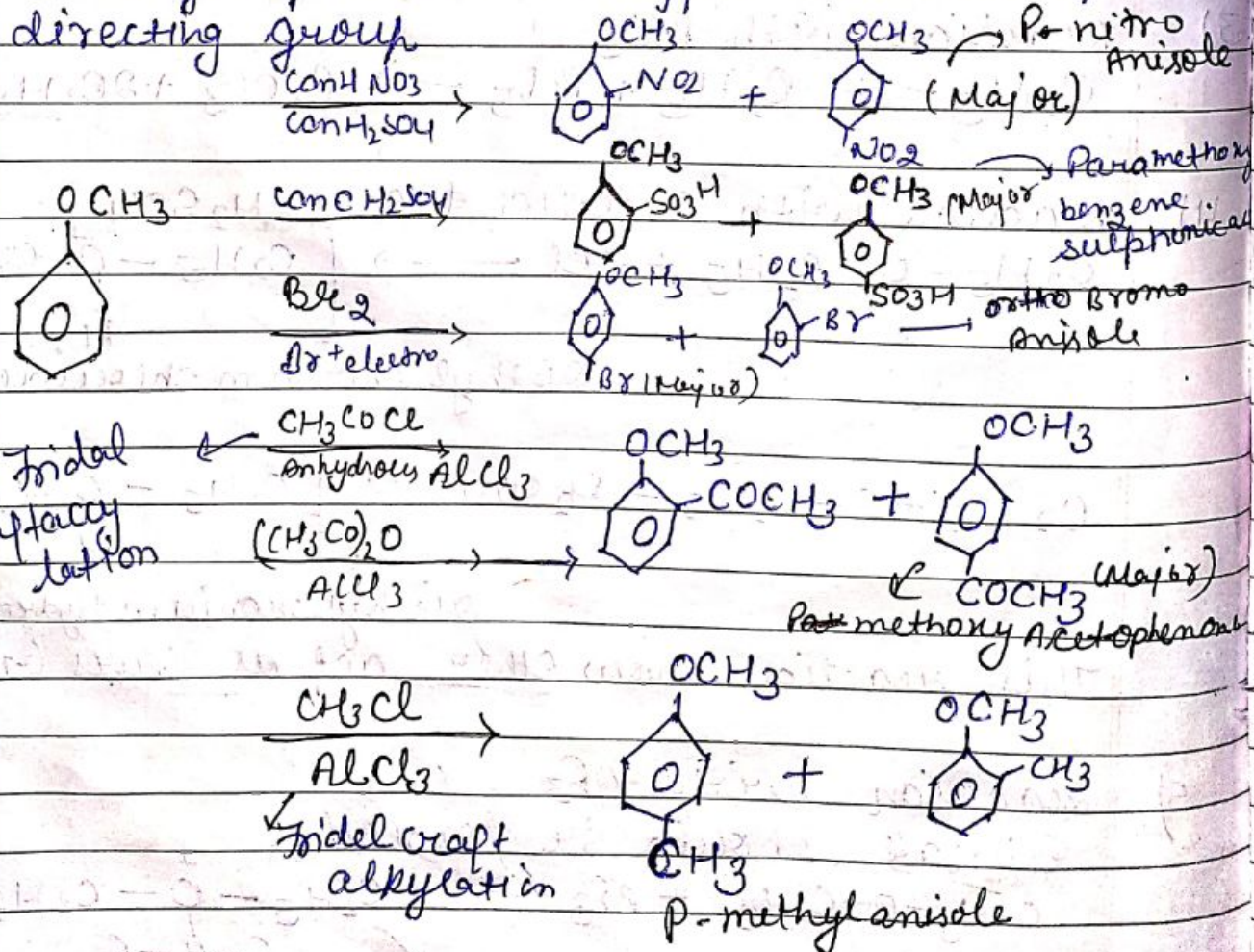
Diethyl oxonium trifluoride ethylate

6) Reaction with atmospheric oxygen or atomic oxygen (nascent)
Diethyl peroxide should be formed
peroxide of ether is explosive in nature



1 Reaction of Anisole

ether group is slow + m effect it is ortho para directing group



uses of Ether: →

used as anesthetic solvent

As refrigerant

use as inert solvent providing moisture free atmosphere

Its trade name is natalite (mixture of alcohol & ether)