14/06/26

(Chapters Completed)

Kinetics

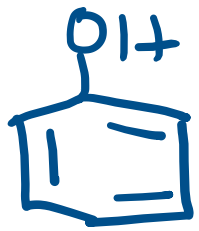
Solutions

~~Haloalkane/arene~~

previous year

Alcohols, Phenols & Ethers (I)

Alcohols must have hydroxy group as a functional group

Phenols 

must have aromatic rings along with hydroxy group

Ethers must have an 'O' oxygen

CH_3-O-CH_3 (dimethyl ether)

$C_2H_5-O-C_2H_5$ (diethyl ether)

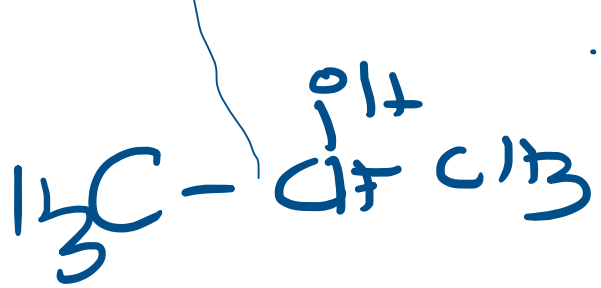
Alcohols Aliphatic (chain)

CH_3-OH methanol

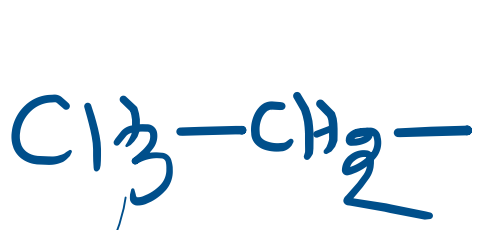
C_2H_5OH ethanol

C_3H_7OH propanol

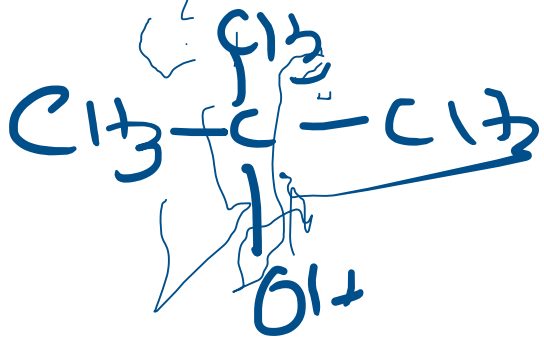
1° - primary
2° - secondary
} positional Isomers



2° alcohol
2-propanol



1° alcohol
1-propanol



3° alcohol

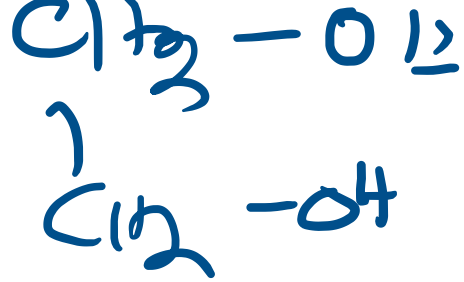
} positional isomers

Monohydric alcohol — must have only one OH group

Dihydric — must have two OH group

Dihydric

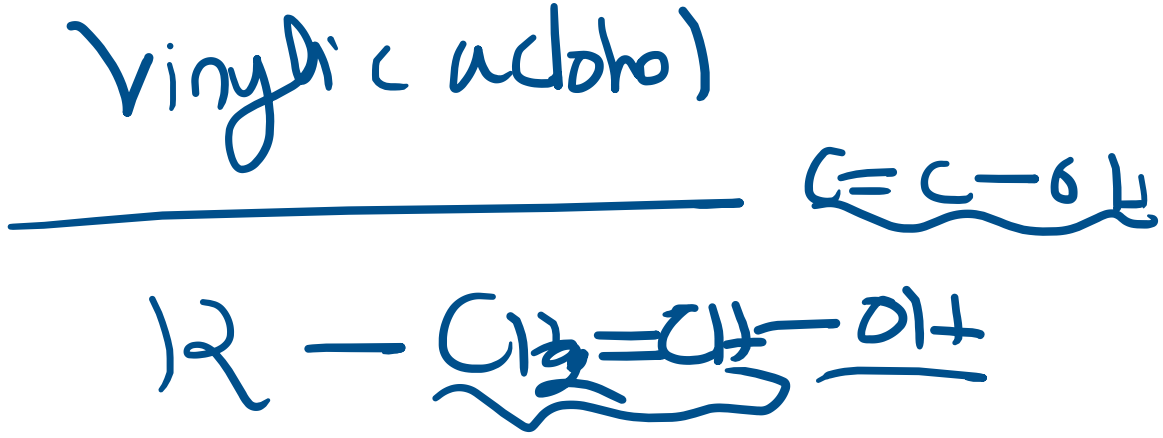
Ethyleneglycol



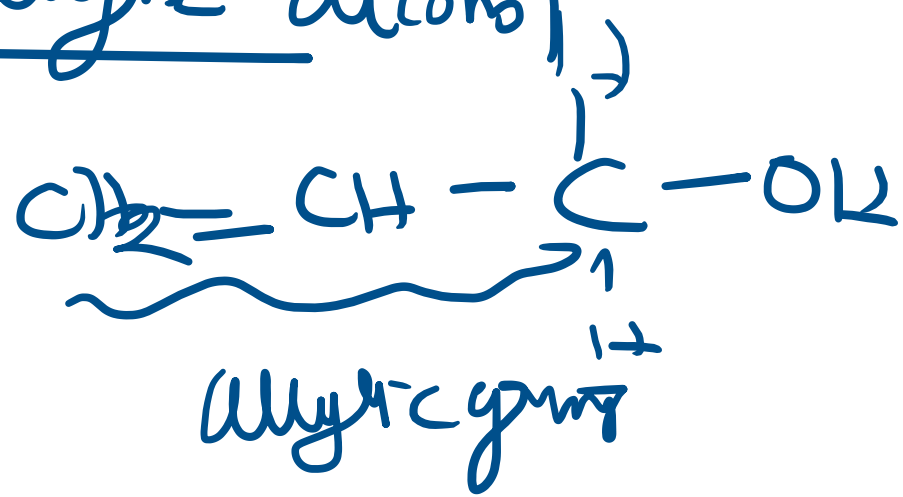
Polyhydric

Hexan-1,2,3,4,5,6-hexol

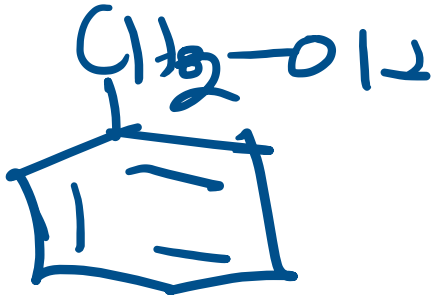
Vinyl alcohol



Allyl alcohol

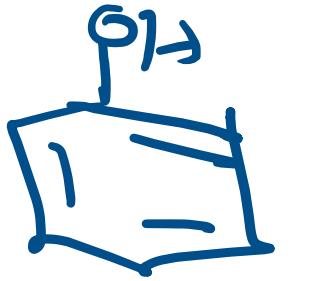


Benzyl

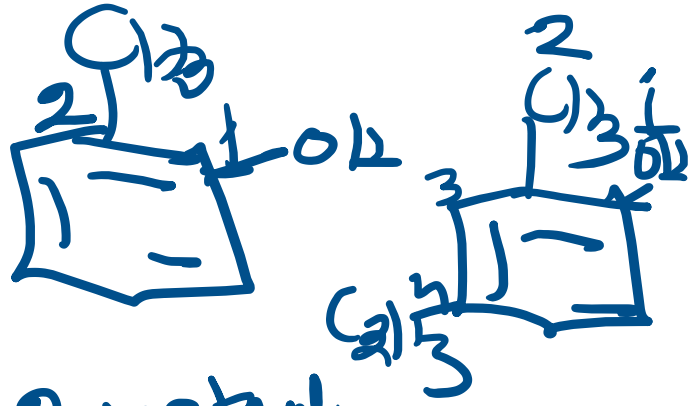


Classification of phenols

Monohydric phenols



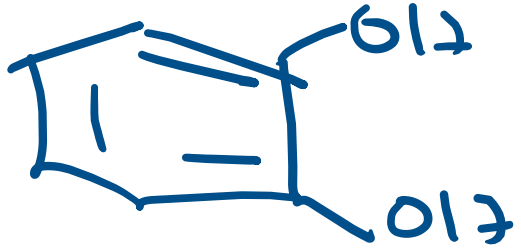
Phenol



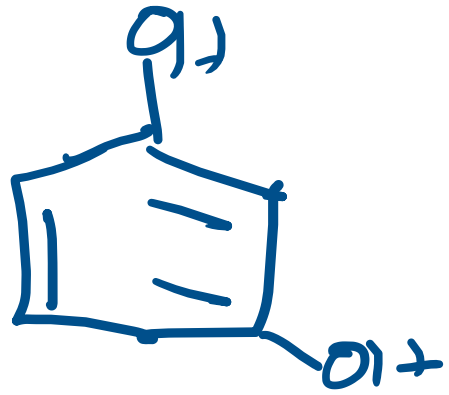
2-methyl Phenol

1-Ethyl 2-methyl Phenol

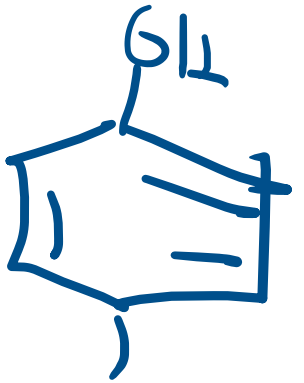
Dihydric phenols



(Catechol)

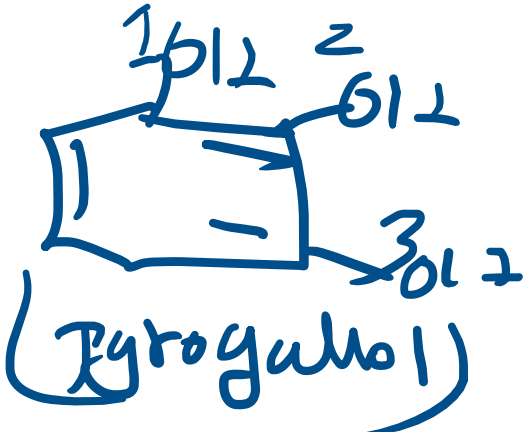


(Resorcinol)

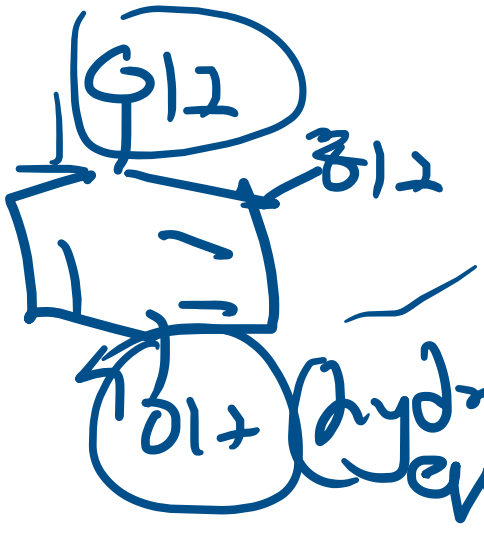


(Quinol)

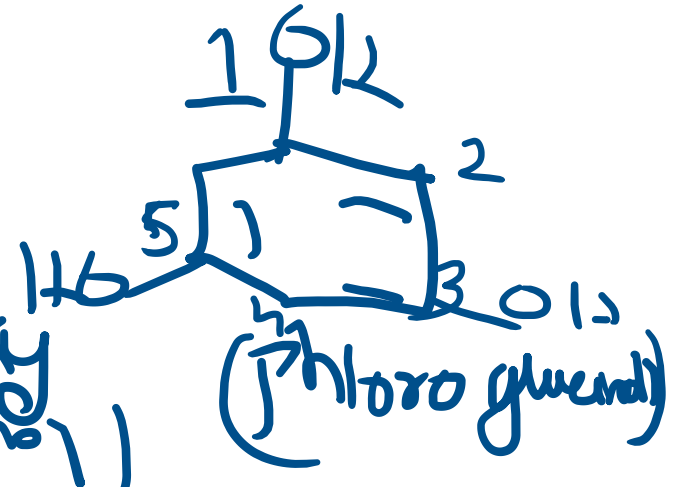
Trihydroxy alcohols/phenols



(Pyrogallol)



(Hydroxy quinol)

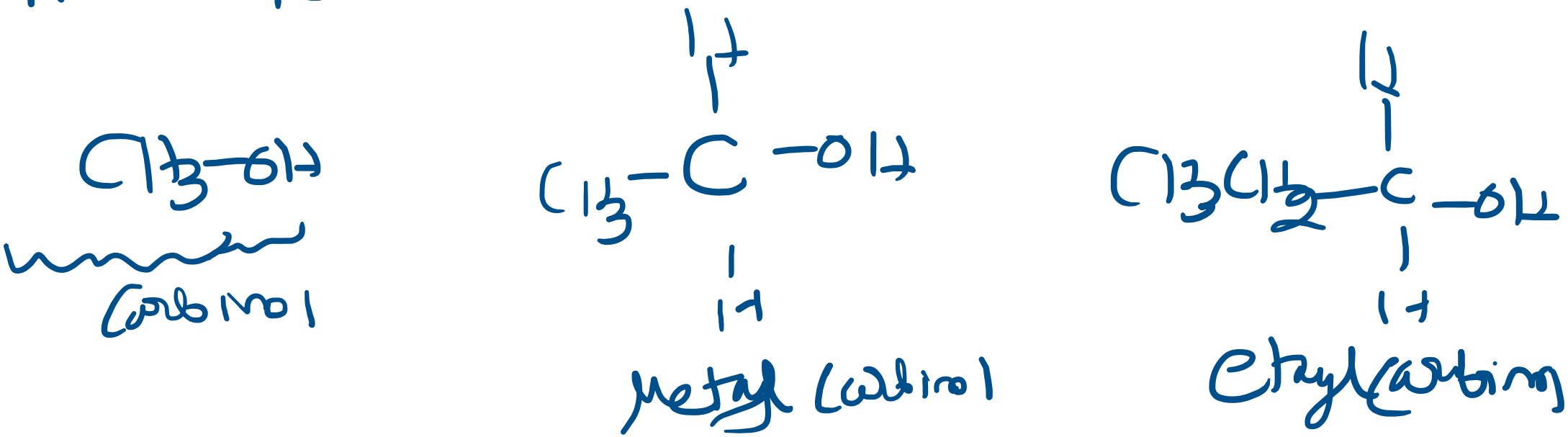


(Phloroglucinol)

Trivial system (Common IUPAC naming)

Carbinol System

Number of alcohol is expressed in terms of carbinol

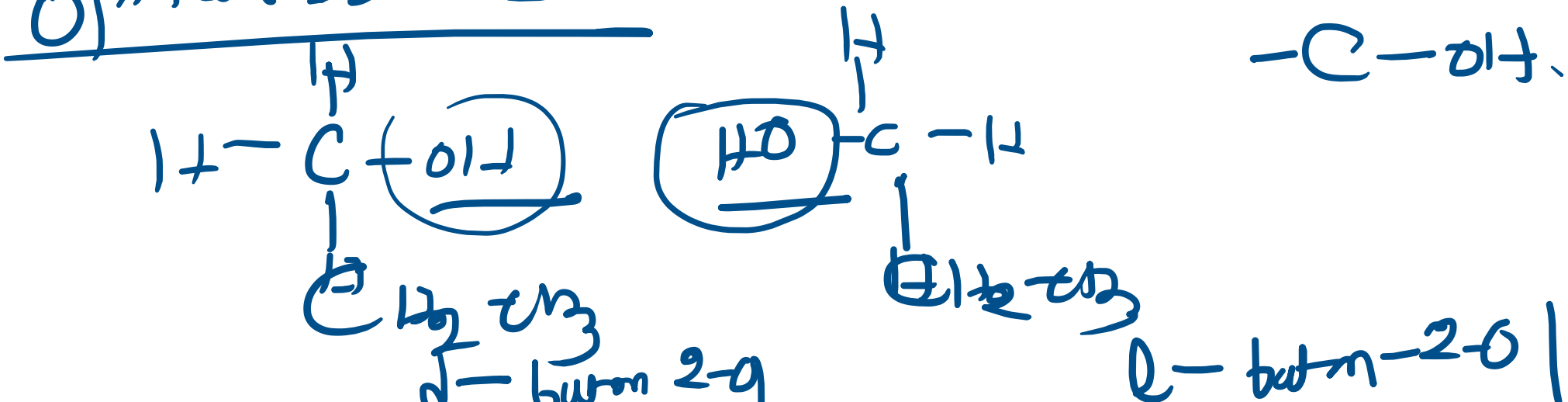


Functional Isomers

CH_3-CH_2-OH (Alcohol)

CH_3-O-CH_3 (Ether)

Optical Isomers

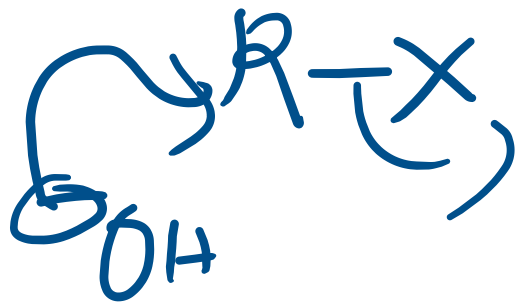


General methods of preparation of alcohol

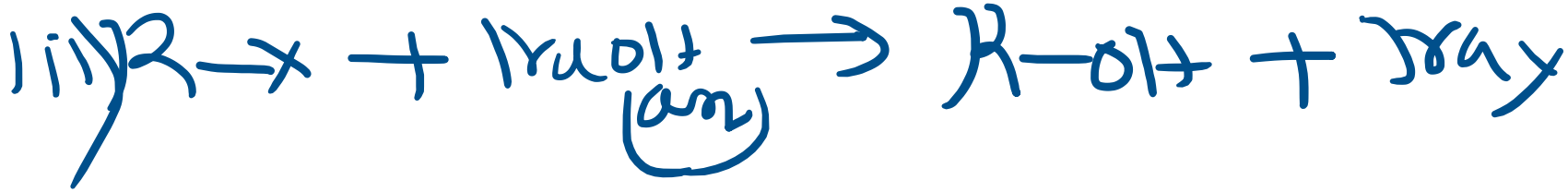
A) From haloalkanes

i) $R-X + KOH(aq) \longrightarrow R-OH + KX$

S_N2

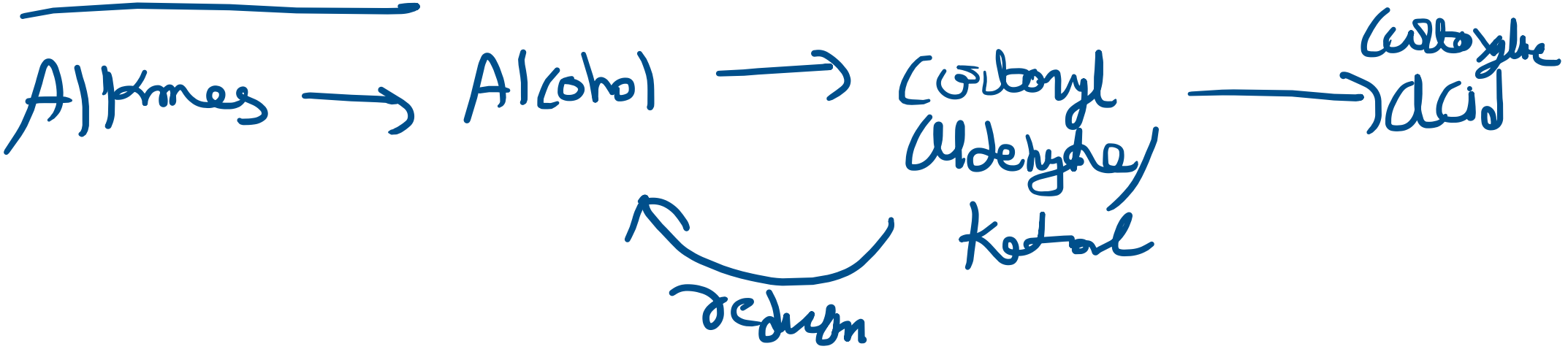


ii) $R-X + \underset{\text{moist}}{AgOH} \rightarrow R-OH + KX$



B) Reduction of carbonyl compounds

For Oxidation

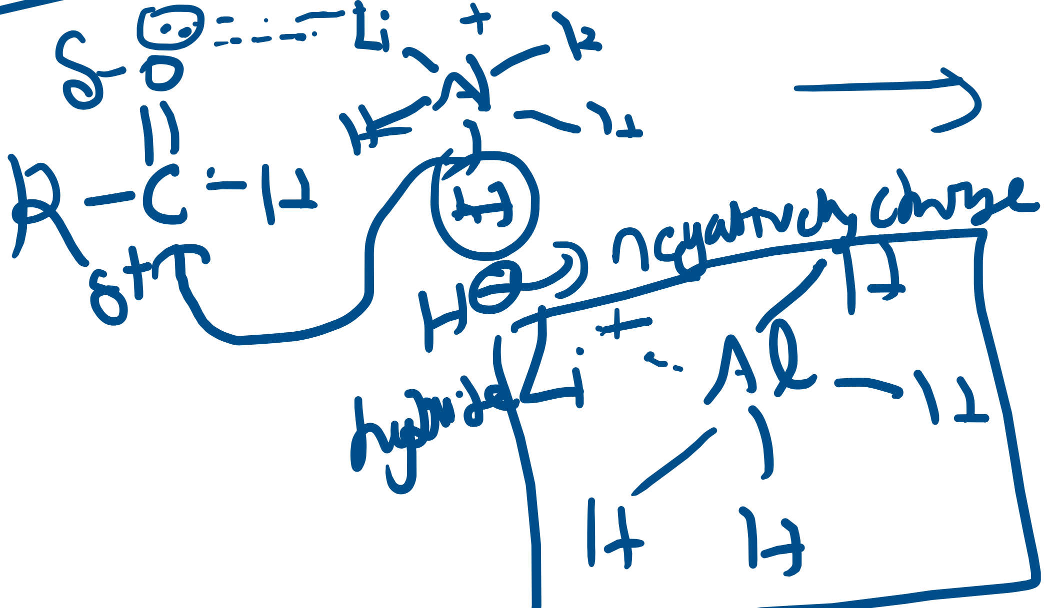


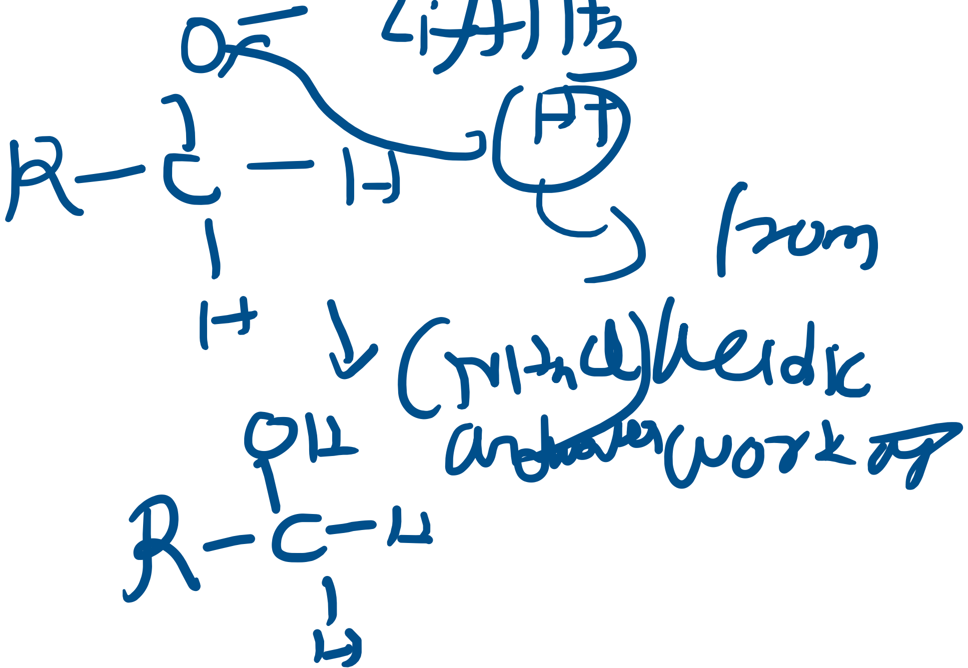
from aldehyde

$NaBH_4$ / $LiBH_4$ / $LiAlH_4$

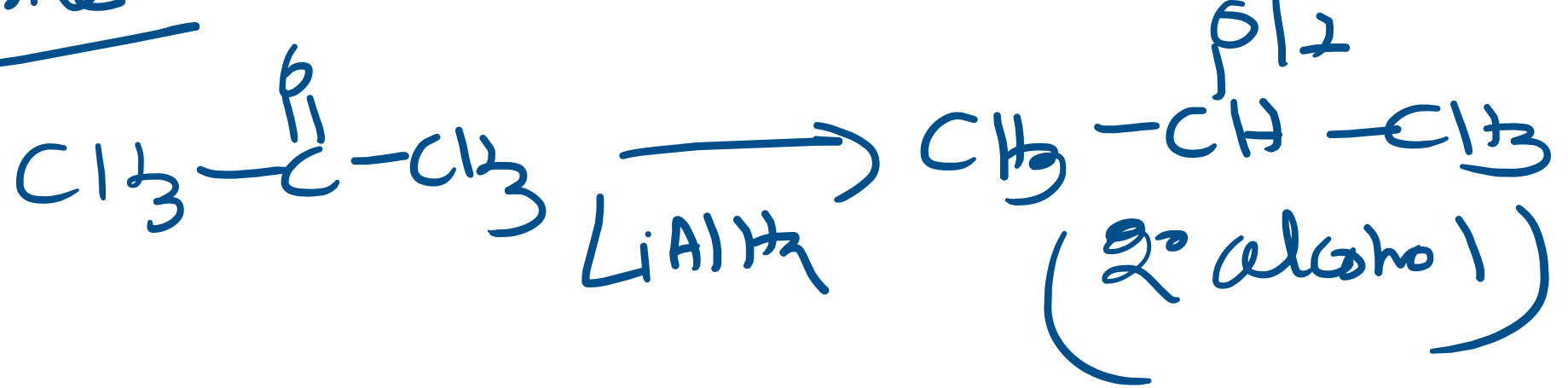
δ^+ C=O δ^- → more EN

Chelation model



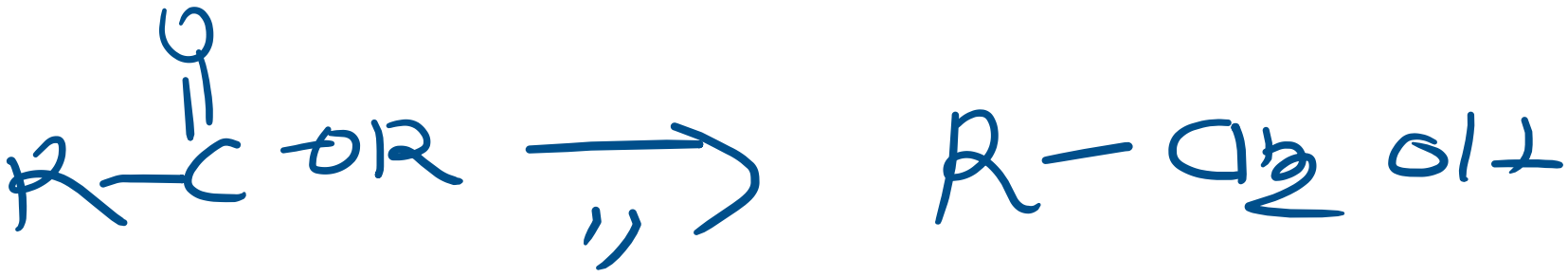


Ketone

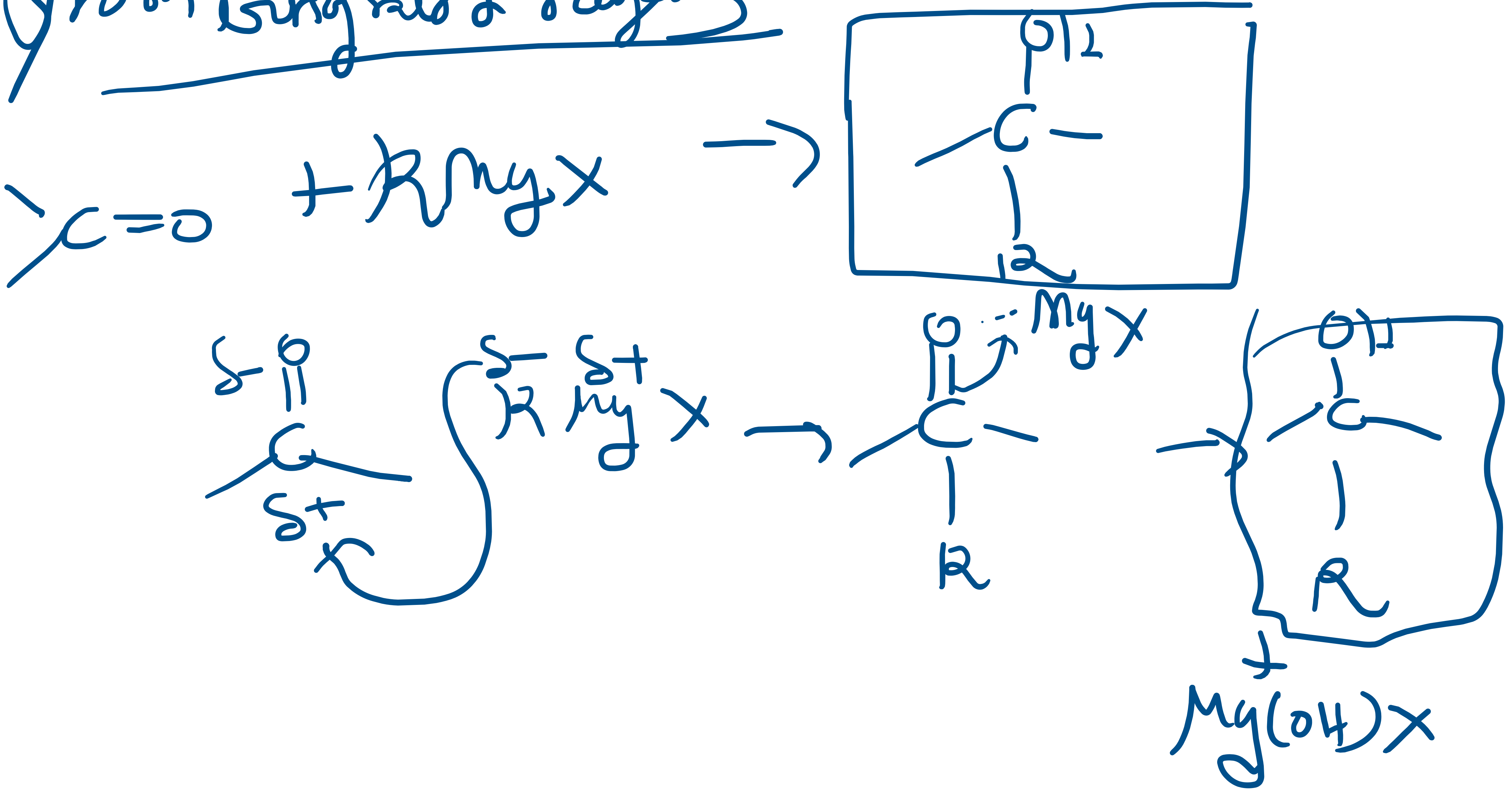


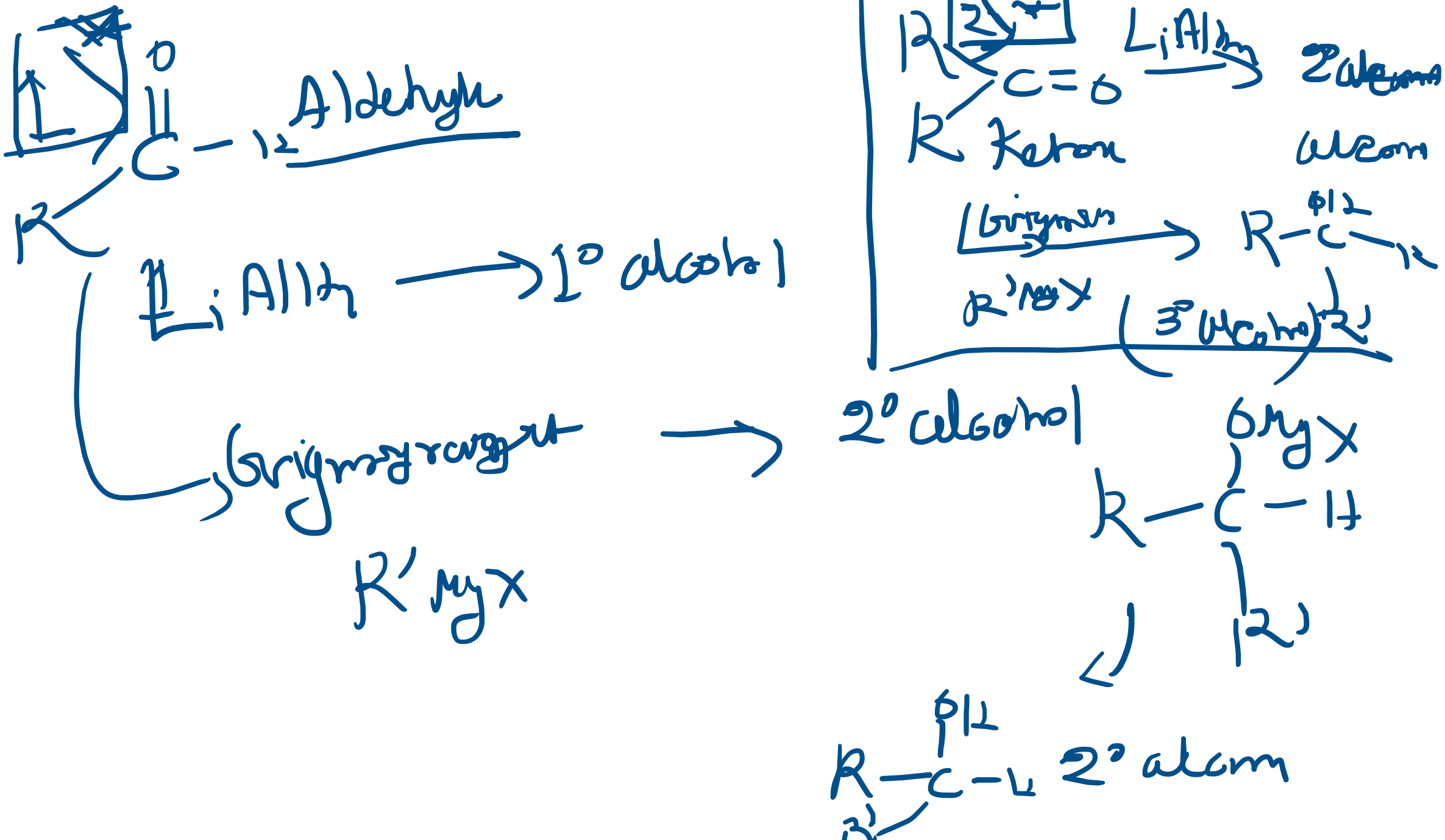
Carboxylic acid

Ester

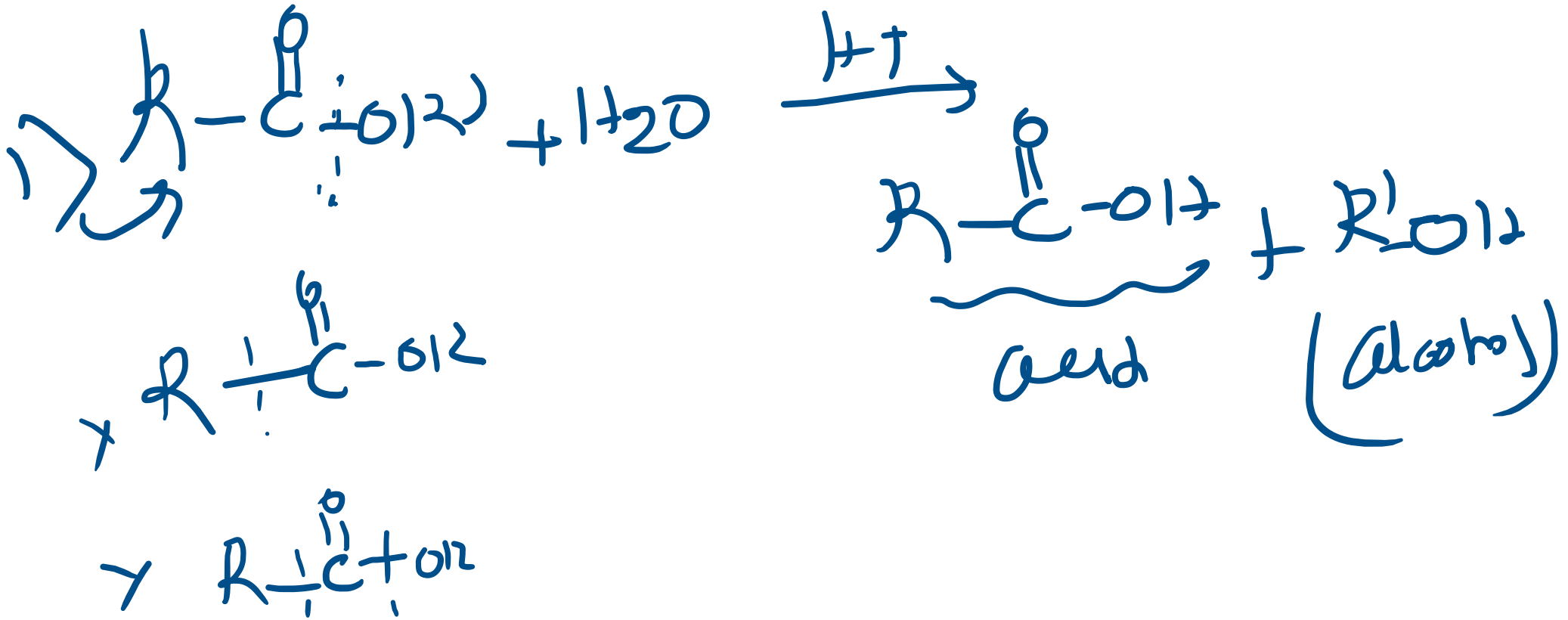


c) from Grignard reagents




Aldehyde
LiAlH4 → 1° alcohol
Grignard reagent → 2° alcohol
R'MgX
Ketone
2° alcohol
3° alcohol
2° alcohol

(Reg 1) > by hydrolysis of ester

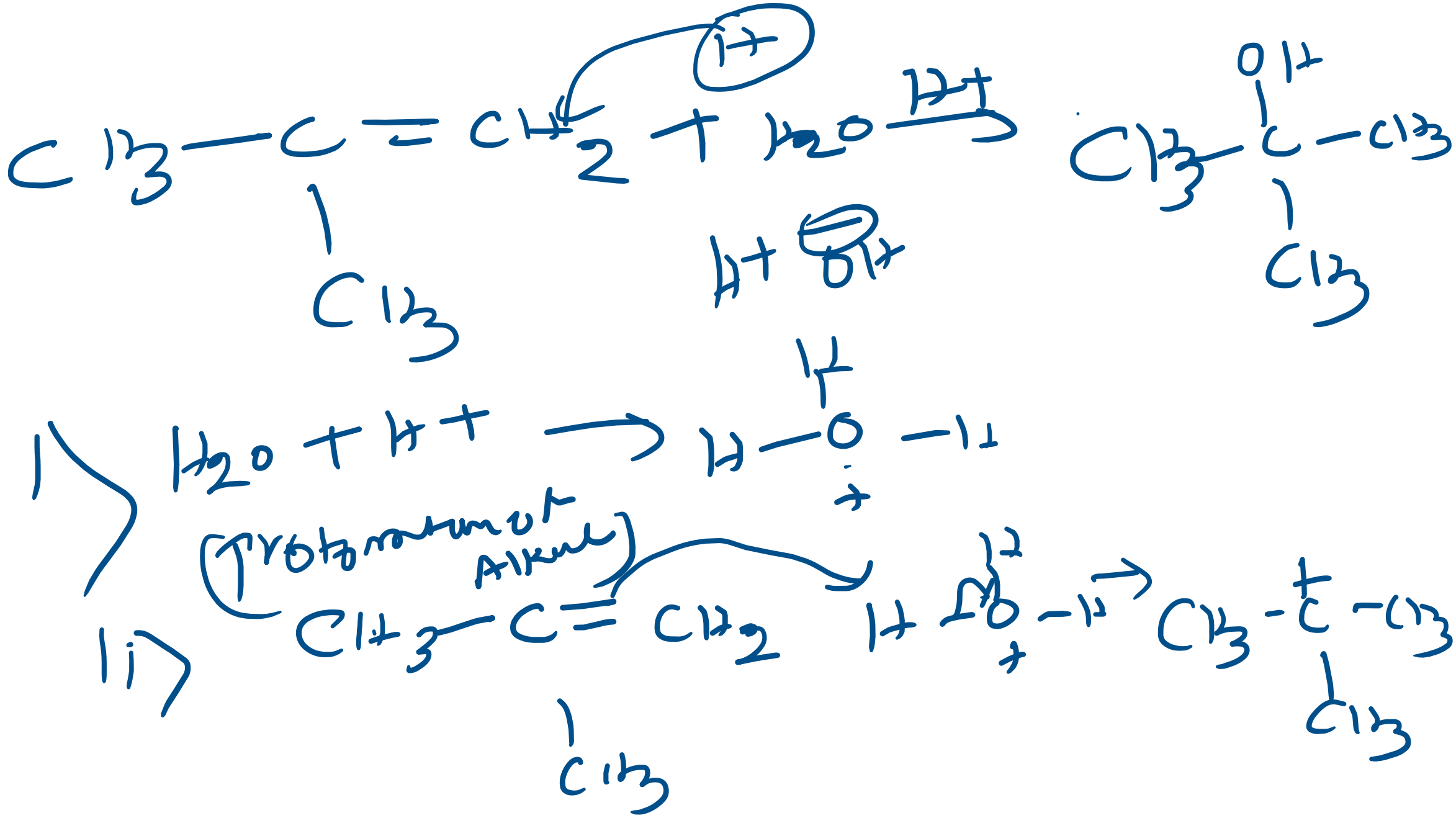


E) Aliphatic primary amines

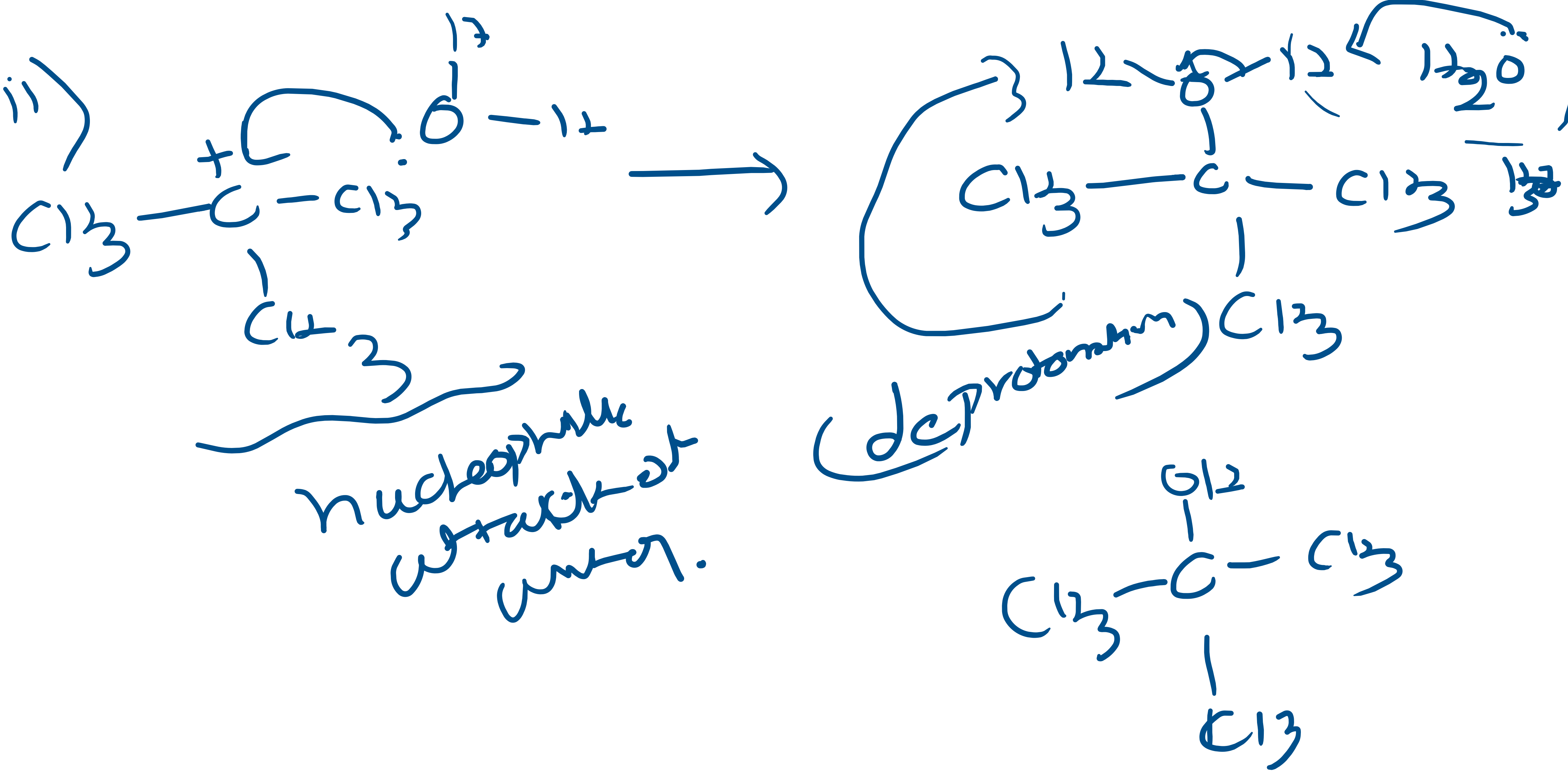
Industrial preparation of alcohols

A) By catalyst hydration

Alkene ⟶ alcohol



iii)



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b) H_2SO_4 and water

$CH_2=CH_2 + H_2SO_4 \rightarrow CH_3-CH_2-OSO_3H$

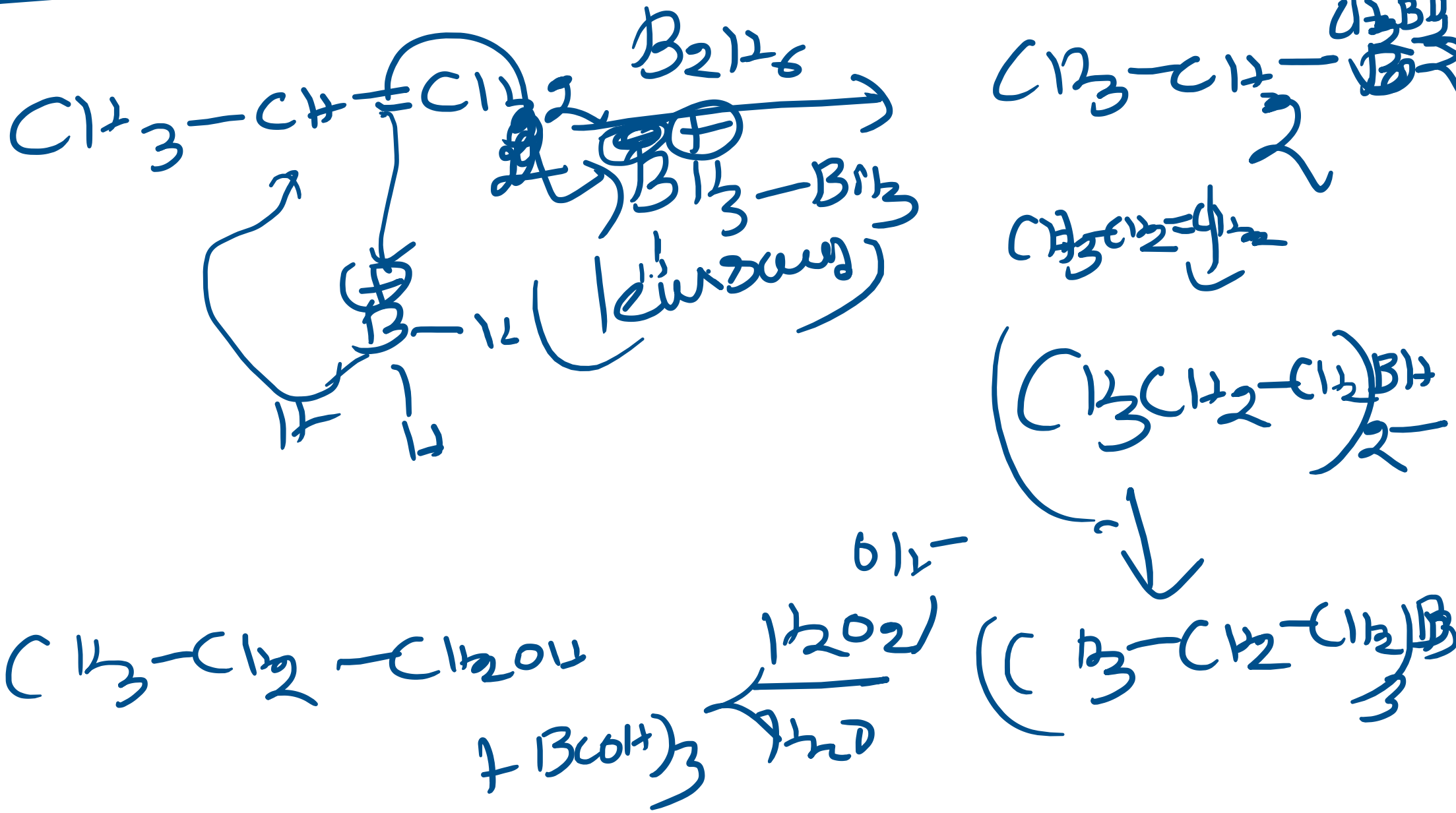
$\downarrow H_2O$

CH_3-CH_2-OH

B) By to H_2SO_4 and water

Write alkenes

c) Indirect anti-markownikoff



Indirect Markownikoff's addition of water

oxymercuration

$CH_3-CH=CH_2$ $\xrightarrow[THF]{(CH_3COO)_2Hg}$ $CH_3-CH(OH)-CH_2-HgOCH_3$

deoxymercuration (reduction) $\xrightarrow{NaBH_4}$ $CH_3-CH(OH)-CH_3$

5) Fermentation from sucrose

$C_{12}H_{22}O_{11} + H_2O \xrightarrow{\text{Invertase}} C_6H_{12}O_6 + C_6H_{12}O_6$

Sucrose → glucose + fructose

glucose $\xrightarrow{\text{zymase}}$ C_2H_5OH

Starch

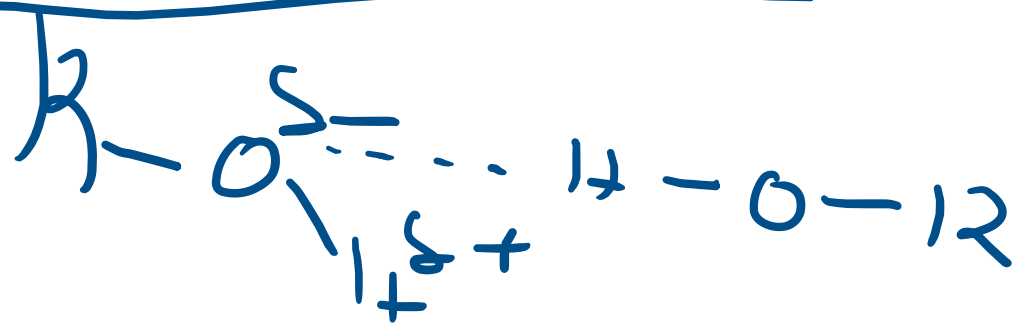
$(C_6H_{10}O_5)_n + H_2O \xrightarrow{\text{diastase}} n\,C_{12}H_{22}O_{11}$

Starch → maltose

$\xrightarrow{\text{maltase},\ H_2O}$ $2C_6H_{12}O_6 \xrightarrow{\text{zymase}} 2C_2H_5OH$

Physical properties

Intermolecular H-bonding



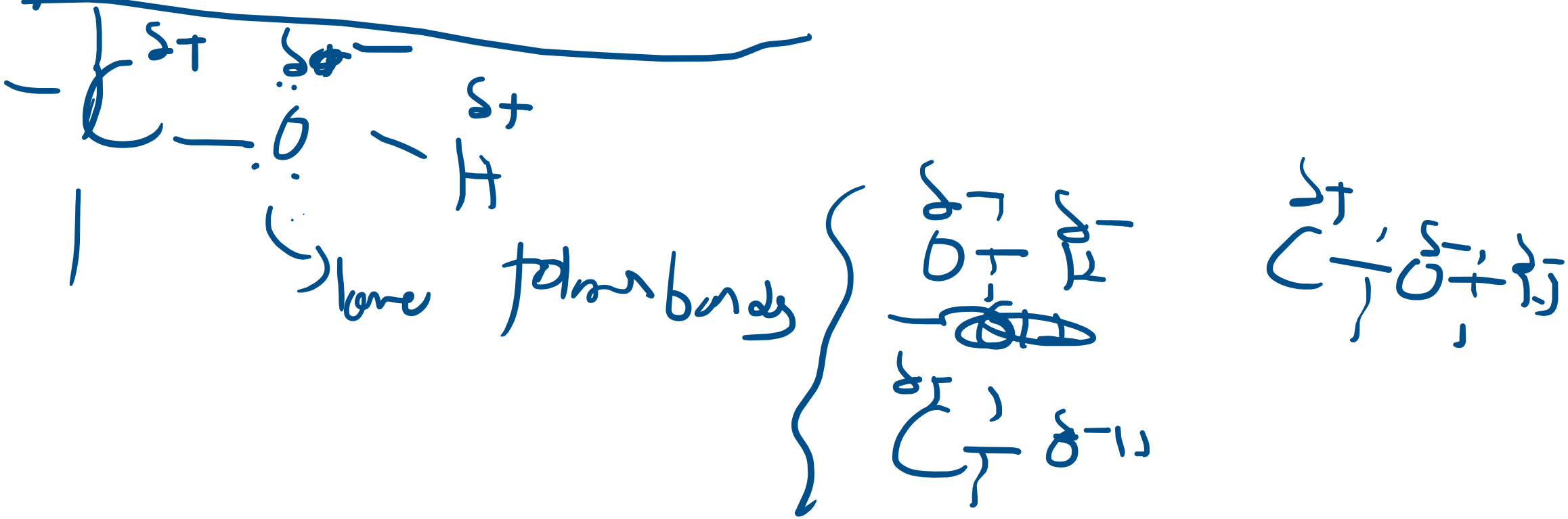
~~Boiling~~

Their boiling points are higher than corresponding alkyl halides Alkane due to presence of H bonding

boiling point of alcohol decreases with branching

1° alcohol < 2° alcohol < 3° alcohol

Chemical properties of C–OH bond



$C_2H_5-O-H \rightleftharpoons C_2H_5O^- Na^+ + H_2 + \frac{1}{2}$

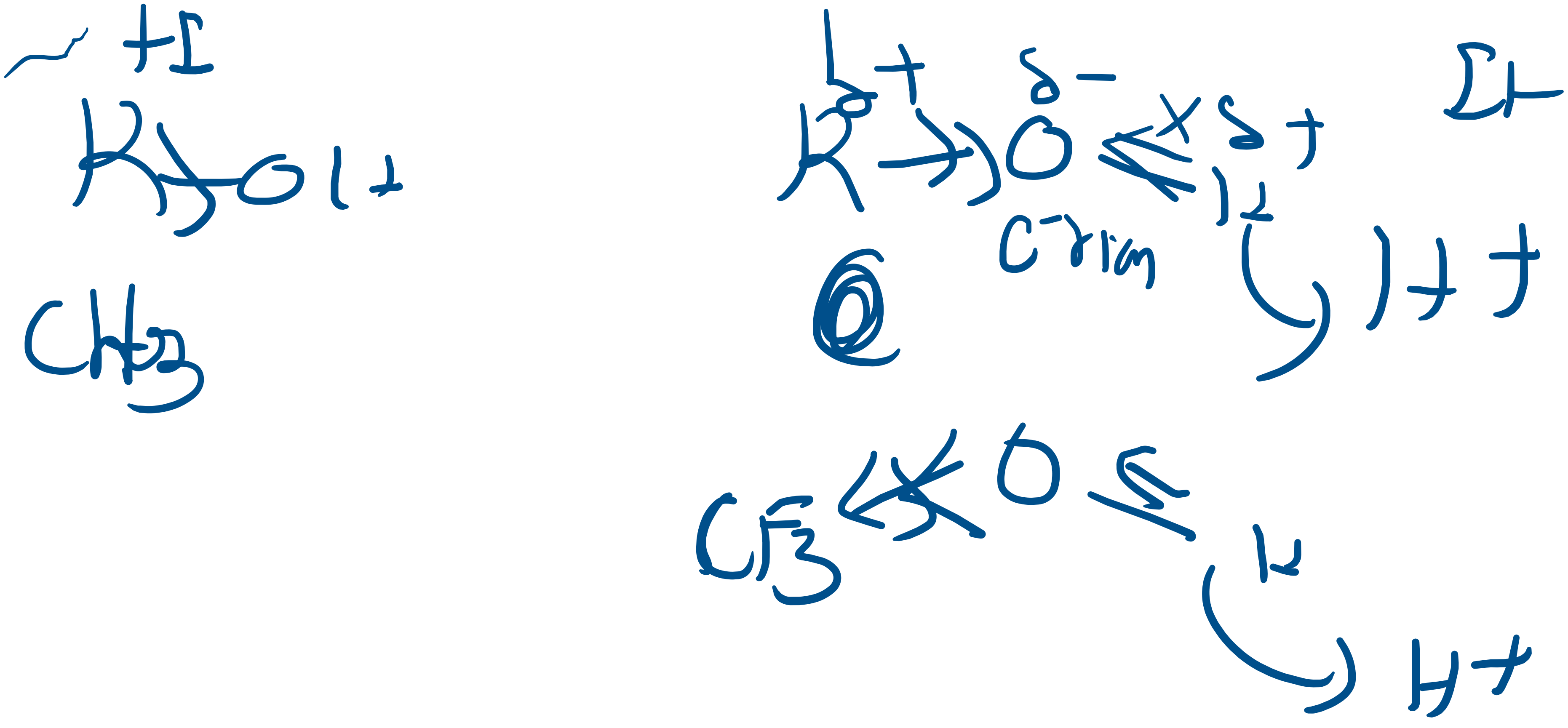
(under arrow: sodium)

Slight acidic due to the polarity OH bonds

$O-H \rightarrow H^+$ acid

Ionisation ranges in 10^{-16}

water 10^{-14}



It will make O more e- rich and will make oxygen electron to pull shared pair of e- towards itself and*

*It will have lesser tendency to form H+ ions