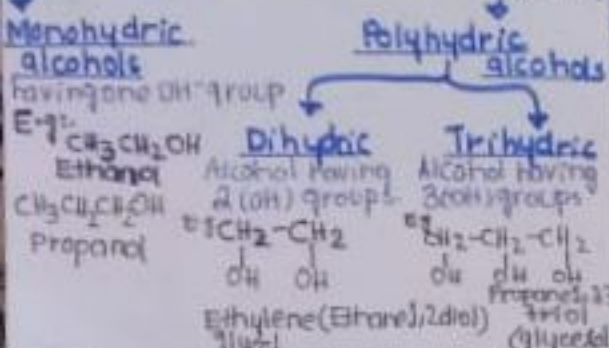
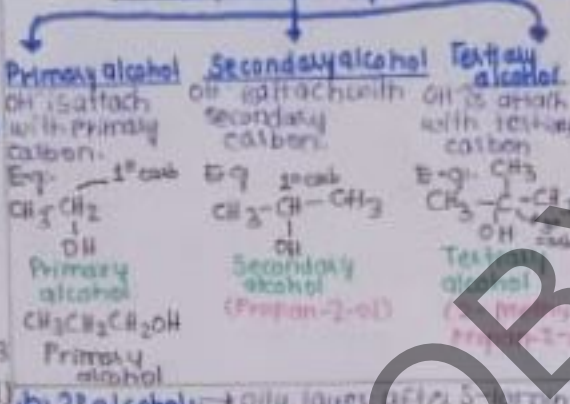


**Alcohol** → Aliphatic oxygen compounds containing OH group as  $-OH$   
 $C_nH_{2n+1}OH$



## Classification of Monohydric



## Preparations:

- By electrophilic addition of steam to alkene  
 $CH_2=CH_2 + H-OH \xrightarrow{H^+} CH_3CH_2OH$
- By the reaction of alkene with  $KMnO_4$   
 $5CH_2=CH_2 + 2KMnO_4 + 6H^+ \rightarrow 5CH_3CH_2OH + 2Mn^{2+} + 4H_2O$
- By the substitution of haloalkane  
 $R-Br + OH^- \xrightarrow{aq} R-OH + Br^-$
- By Reduction of carbonyl compound  
 $H-C(=O)-H + 2[H] \xrightarrow{LiAlH_4} H-CH_2-H$  Methanal → Methanol  
 $R-C(=O)-R + 2[H] \xrightarrow{LiAlH_4} R-CH_2-R$  Aldehyde → 1° Alcohol  
 $R-C(=O)-R + 2[H] \xrightarrow{LiAlH_4} R-CH(OH)-R$  Ketone → 2° Alcohol

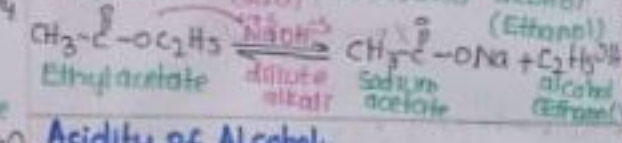
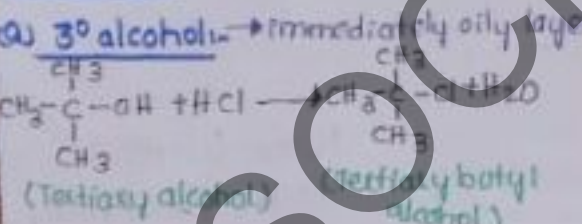
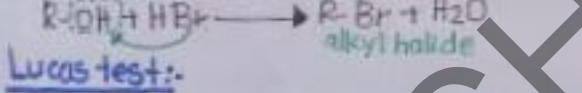
## Reactions of alcohols:-

- Combustion** → Burn completely in air to form  $CO_2 + H_2O + \text{heat}$   
 $CH_3-OH + 2O_2 \rightarrow CO_2 + 2H_2O + \text{heat}$
- Rxn with  $SOCl_2$  &  $PX_3$  to produce  $R-X$**   
 $R-CH_2OH + SOCl_2 \xrightarrow{\text{heat}} RCH_2Cl + SO_2 + HCl$   
 $3R-OH + PCl_3 \rightarrow 3R-Cl + H_3PO_3$   
 $5R-OH + PCl_5 \rightarrow 5R-Cl + H_3PO_4 + H_2O$

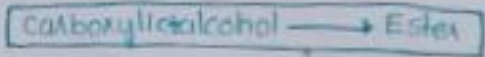
- 2° alcohol** → oily layer after 2 hours  
 $CH_3-CH(OH)-CH_3 + HCl \xrightarrow{ZnCl_2, \Delta} CH_3-CH_2Cl + H_2O$  Secondary alcohol
- 1° alcohol** → oily layer on heating  
 $CH_3-CH_2-OH + HCl \xrightarrow{ZnCl_2, \Delta} CH_3-CH_2Cl + H_2O$  Primary alcohol
- 3° alcohol** → 2° Alcohol > 1° alcohol
- Reaction with  $KBr$**   
 $R-OH + KBr + H_2SO_4 \rightarrow R-Br + H_2O + KHSO_4$

- Dehydration of alcohol**  
 $CH_3CH_2OH \xrightarrow{conc. H_2SO_4, 180^\circ} CH_2=CH_2 + H_2O$  Elimination alkene  
 $2CH_3CH_2OH \xrightarrow{conc. H_2SO_4, 140^\circ} CH_3CH_2O-CH_2CH_3 + H_2O$  biethyl ether
- Formation of Ester**  
 $CH_3-C(=O)-OH + C_2H_5OH \xrightarrow{H^+} CH_3-C(=O)-OC_2H_5 + H_2O$  Acetic acid + Ethanol → Ethyl acetate

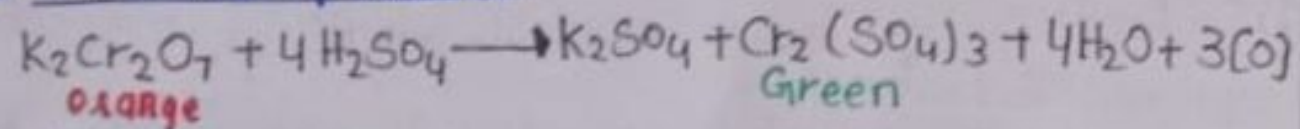
## Reaction with $HX$ :-



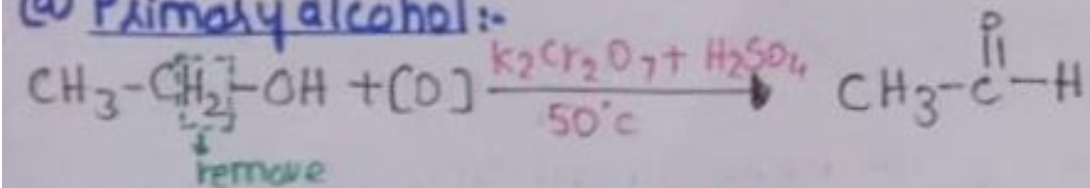
**Acidity of Alcohol**  
 $2R-OH + 2Na^+ \rightarrow 2R-O^-Na^+ + H_2$   
 $2H^+-OH^- + Na^+ \rightarrow NaOH + H_2$   
 $R-OH \rightleftharpoons R-O^- + H^+$   
 alkyl weak e- donor (H+ weak acid) (alcohol is less polar)  
 $H^+-OH^- \rightleftharpoons H^+ + OH^-$  (water is more polar) (H+ good acid) (polarity of water net zero)



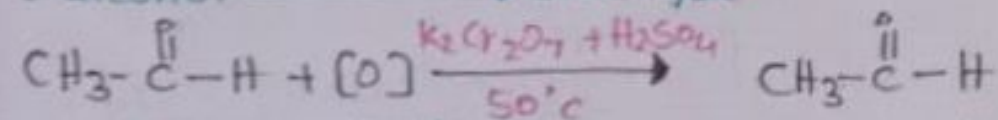
### (a) Oxidation of Alcohol:-



#### (a) Primary alcohol:-

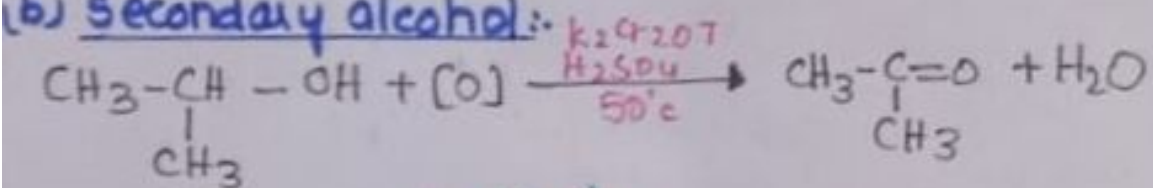


1° alcohol  $\xrightarrow{\quad}$  aldehyde



Aldehyde  $\xrightarrow{\text{oxidized}}$  carboxylic acid

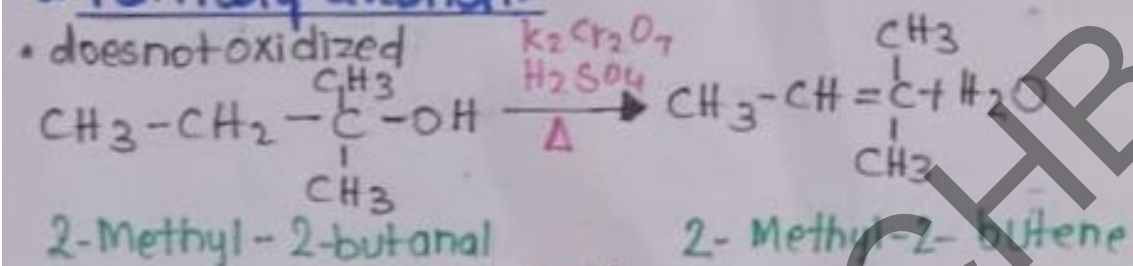
#### (b) Secondary alcohol:-



2° alcohol  $\xrightarrow{\text{oxidized}}$  ketone

#### (c) Tertiary alcohol:-

• does not oxidized



2-Methyl-2-butanol

2-Methyl-2-butene

3° alcohol  $\xrightarrow{\text{not oxidized}}$  alkene

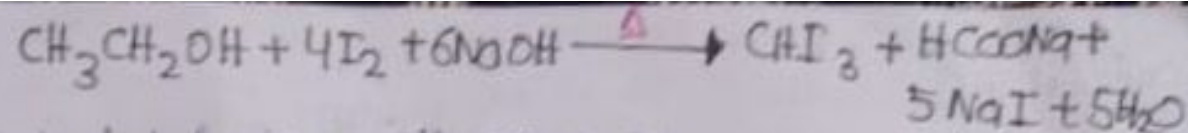
#### (b) Iodoform reaction:- (ppt yellow)

1° alcohol  $\xrightarrow{\quad}$  Ethanol

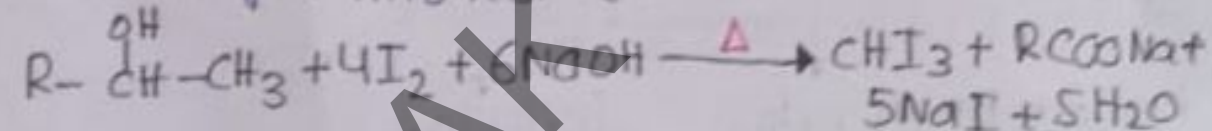
2° alcohol  $\xrightarrow{\quad}$  one CH<sub>3</sub> group (CH<sub>3</sub>-CH)

3° alcohol  $\xrightarrow{\quad}$  do not give this test

• Alcohol treated I<sub>2</sub> and Excess NaOH



• 2° alcohol having -CH<sub>3</sub> group on one side give this test (46  $\rightarrow$  55)



3° alcohol do not give this test

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Teacher:- Miss Ayesha