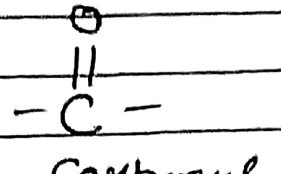
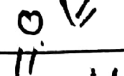
Aldehydes & Ketones - 1

Introduction : Preparation of Aldehydes & Ketones (Common Method to both)

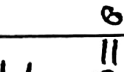


Carbonyl group

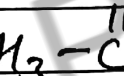


Aldehyde

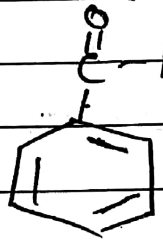
Secondary suffix → 'al'

1) 

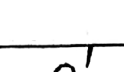
methanal
Formaldehyde

2) 

Ethanal
Acetaldehyde

3) 

Benzaldehyde

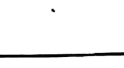


Ketone

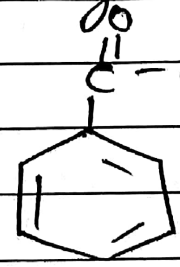
secondary → 'one'
suffix

1) 

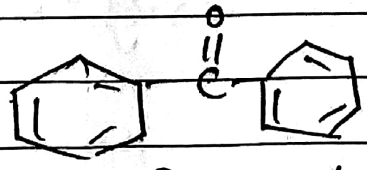
propanone or (-2one)
Acetone
Dimethyl ketone

2) 

butan-2-one
Ethyl methyl ketone

3) 

Acetophenone
Methyl phenyl ketone

4) 

Benzophenone
Diphenyl ketone

1 & 4 → Symmetrical ketone

Preparation of Aldehydes & Ketones

① By oxidation of Alcohols → with :-

i) with acidic $K_2Cr_2O_7$ OR acidic $KMnO_4$
(only Secondary Alcohols)

2° Alcohols ⟶ Ketones

$$CH_3-\underset{\underset{OH}{|}}{CH}-CH_3 \xrightarrow[\text{OR}\ KMnO_4/H^+]{K_2Cr_2O_7/H^+} CH_3-\overset{\overset{O}{||}}{C}-CH_3$$

1° Alcohol ⟶ Carboxylic Acid
3° Alcohol ⟶ NO effect

ii) ① P.C.C. (Pyridinium Chlorochromate)

$: CrO_3 : HCl$

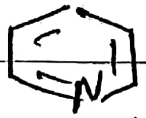
1 : 1 : 2

② Jone's Reagant [$H_2Cr_2O_4$ in aq Acetone]

CrO_3/H_2SO_4, Acetone

③ Collin's Reagant  $: CrO_3 : CH_2Cl_2$

2 : 1 : 1

④ Sarret's Reagant  $: CrO_3 : HCl : CH_2Cl_2$

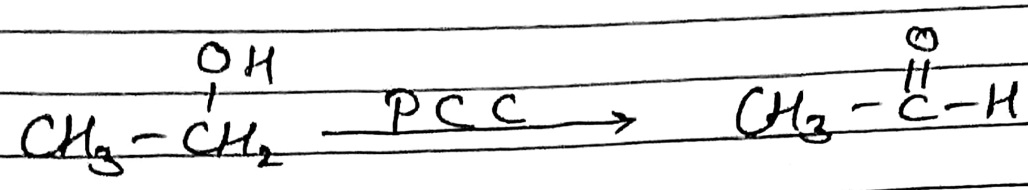
1 : 1 : 1 : 1

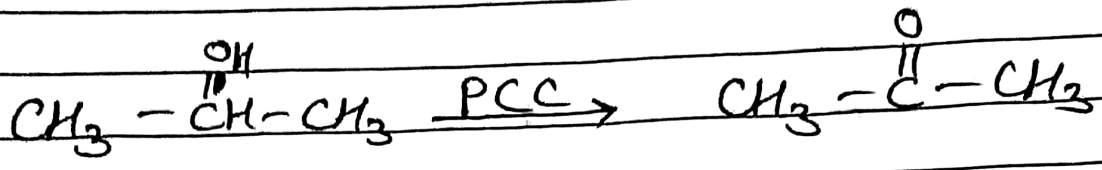
⑤ NBS

All ① to ⑤ oxidises

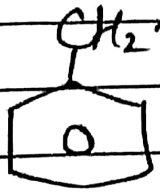
1° Alcohol → Aldehyde

2° Alcohol → Ketones.





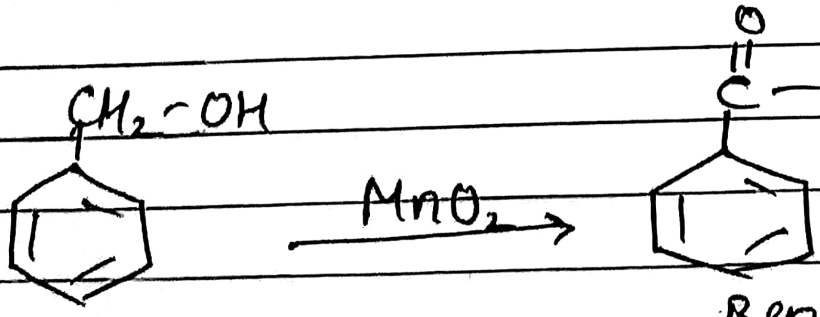
iii) with MnO_2 : oxidises benzylic or allylic alcohols



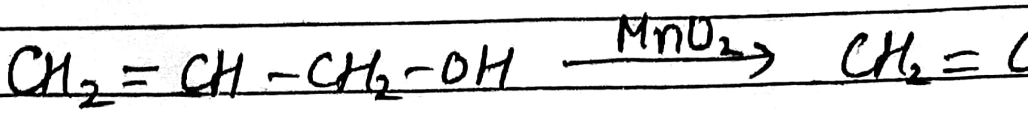
benzylic alcohols

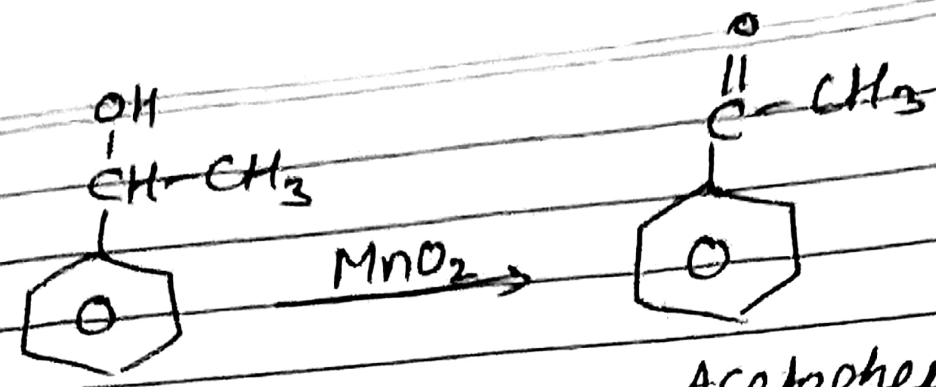
$CH_2 = CH - CH_2 - OH$
allylic alcohols

1° Alcohol → Aldehyde
2° Alcohol → Ketone



Benzaldehyde





2° benzylic alcohol

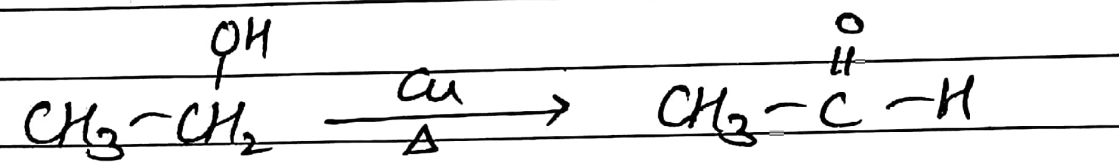
Acetophenone

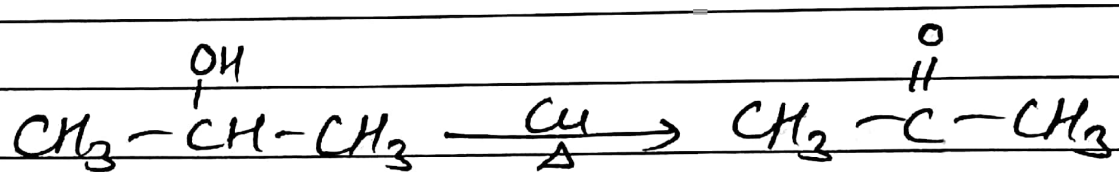
② By dehydrogenation of Alcohols :-

with Red hot Copper tube (passing vapours of alcohols)

1° Alcohol ⟶ Aldehyde

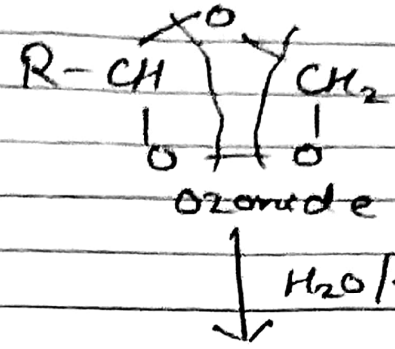
2° Alcohol ⟶ Ketone





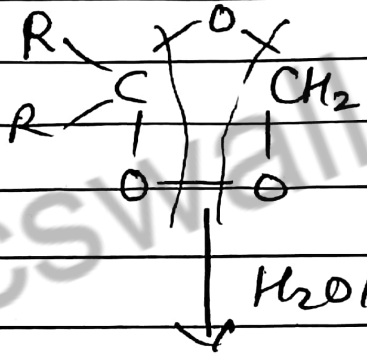
③ By ozonolysis of alkene:

$$R-CH=CH_2 \xrightarrow[CCl_4]{O_3}$$



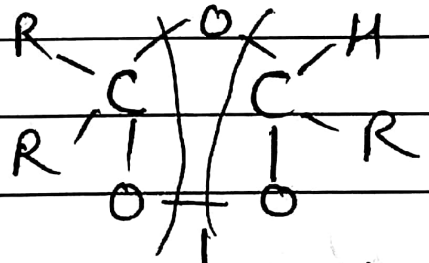
$$\xrightarrow{H_2O/Zn} RCHO + HCHO$$

$$R-\underset{R}{C}=CH_2 \xrightarrow[CCl_4]{O_3}$$



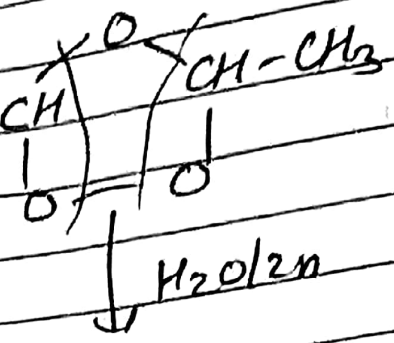
$$\xrightarrow{H_2O/Zn} R-\overset{O}{\overset{\|}{C}}-R + HCHO$$

$$R-\underset{R}{C}=CH-R \xrightarrow[CCl_4]{O_3}$$



$$\xrightarrow{H_2O/Zn} R-\overset{O}{\overset{\|}{C}}-R + RCHO$$

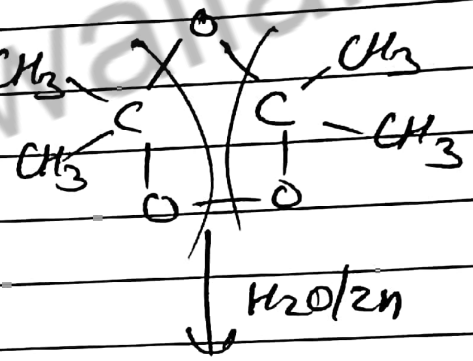
example:

i) $CH_3CH=CH-CH_3 \xrightarrow[CCl_4]{O_3}$ 

$CH_3CHO + CH_3CHO$

Short tricks: double Bond तोड़ दो, O को जोड़ दो

$CH_3-CH=CH-CH_3 \xrightarrow[ii)\ H_2O/Zn]{i)\ O_3/CCl_4} CH_3CHO + CH_3CHO$

ii) $CH_3-\underset{CH_3}{\overset{}{C}}=\underset{CH_3}{\overset{}{C}}-CH_3 \xrightarrow[CCl_4]{O_3}$ 

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

Short tricks:

$CH_3-\underset{O}{\overset{CH_3}{C}}=\underset{O}{\overset{CH_3}{C}}-CH_3 \xrightarrow[ii)\ H_2O/Zn]{i)\ O_3/CCl_4} 2CH_3-\overset{O}{\overset{\|}{C}}-CH_3$

④ By hydration of alkynes: in presence of dil H_2SO_4 & $HgSO_4$

Ethyne ⟶ Acetaldehyde

Any other alkyne ⟶ Ketone

$$CH \equiv CH \xrightarrow[\substack{dil\ H_2SO_4 \\ HgSO_4 \\ \Delta}]{H-OH} H-\overset{H}{\underset{3}{C}}=\overset{OH}{\underset{2}{C}}-H \xrightarrow[\substack{Tautomerism \\ 1,3\ H\ Migration}]{} CH_3-\overset{O}{\overset{\|}{C}}-H$$

$$CH_3-C \equiv CH \xrightarrow[\substack{dil\ H_2SO_4 \\ HgSO_4 \\ \Delta}]{H-OH} CH_3-\overset{OH}{\underset{2}{C}}=\overset{H}{\underset{3}{C}}-H$$

Tautomerism
1,3 H Migration

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

$$CH_3-C \equiv C-CH_3 \longrightarrow CH_3-\overset{OH}{C}=\overset{H}{C}-CH_3$$

$$CH_3-\overset{O}{\overset{\|}{C}}-CH_2-CH_3$$