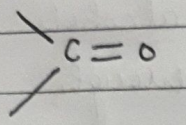
Aldehydes, Ketones & Carboxylic acid

Date __/__/____

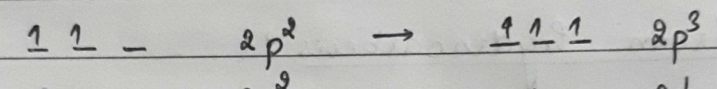
Saathi

Structure of carbonyl groups

geometry: trigonal coplanar

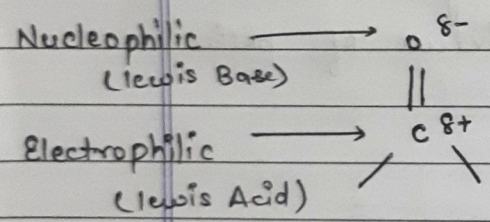


Carbon of carbonyl group = sp^2



ground state → excited state

Polarity of carbonyl group:



O is more electronegative than C.

General Preparation of Aldehydes & Ketones :-

(1) oxidation of alcohols :-

Primary alcohols $\xrightarrow{\text{oxidation}}$ aldehydes

Secondary alcohols $\xrightarrow{\text{oxidation}}$ ketones

Reagents :- PCC (Pyridinium chloro chromate)

CrO_3 in ~~acid~~ medium acid

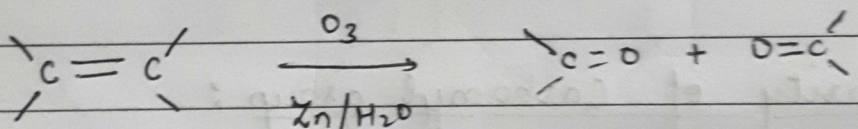
Date __/__/____

(2.) Dehydrogenation of alcohols :-

- Industrial method
- Suitable for volatile alcohols
- Alcohols are passed through Silver (Ag) or Copper (Cu) catalyst.

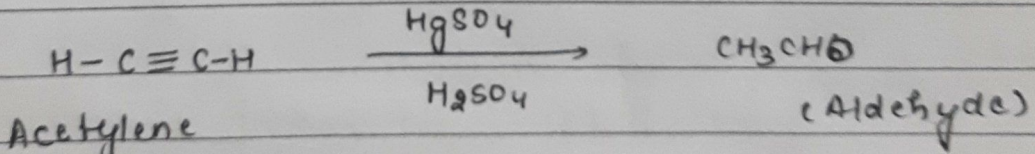
(3.) From hydrocarbons :-

a) ozonolysis of alkenes :-

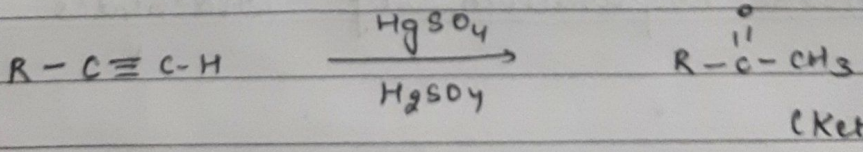


(aldehydes, ketones or mixture of both).

b) hydration of alkynes :-



Acetylene



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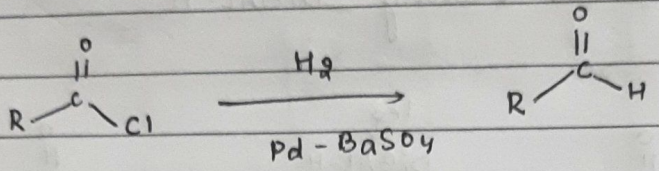
Special Preparation of Aldehydes :-

(1°) From Acyl chloride :

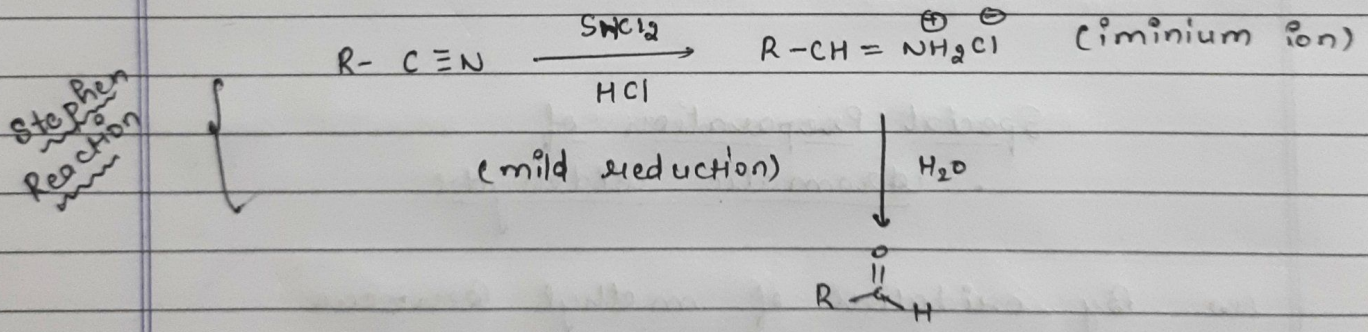


Rosenmund Reaction

Quinoline

- $BaSO_4$ has low surface area, reduces the activity of Pd.
- For some reactions acid chloride poisons such as Thiourea, Quinoline etc.

(2°) From Nitriles :

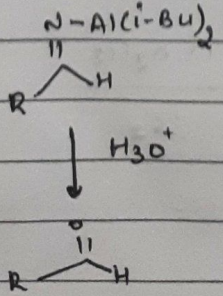


(3°) From Nitrile using DIBAL-H

(Di-isobutyl Aluminium Hydride)

↓

(Milder than $LiAlH_4$ but stronger than $NaBH_4$)



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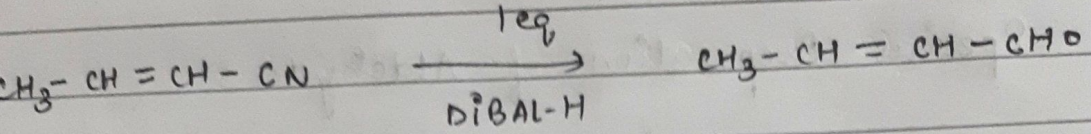
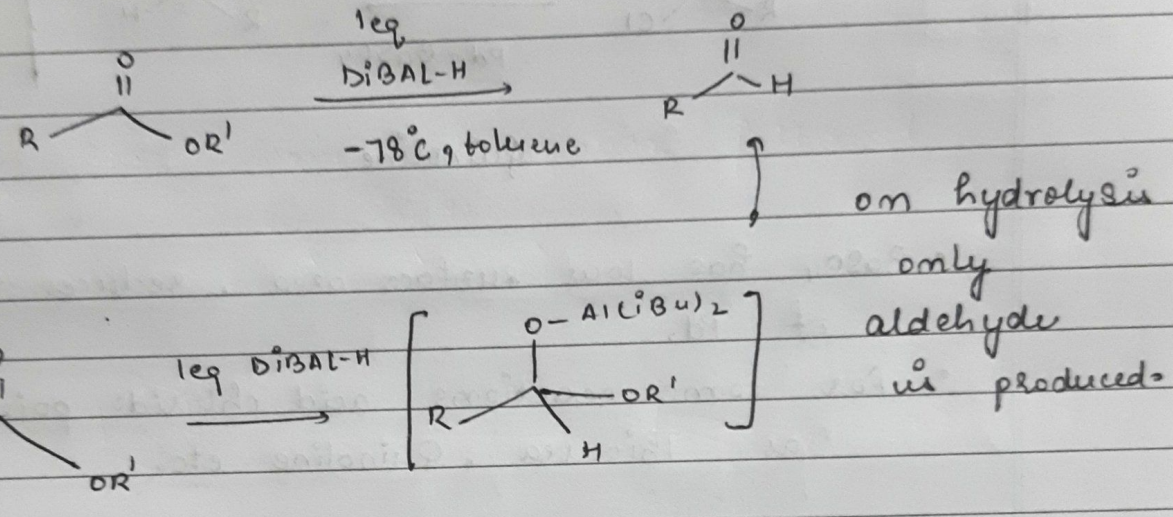


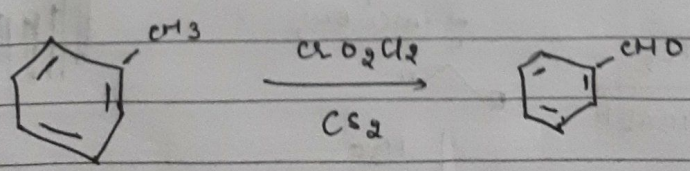
(ii) From Esters using DiBAL-H



Special Preparation of Aromatic aldehydes

(i) By oxidation of methyl Benzene

(A) By oxidation with CrO_2Cl_2 (chromyl chloride)



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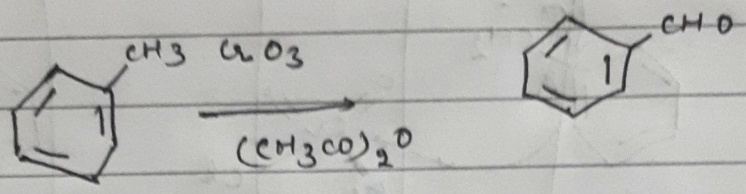
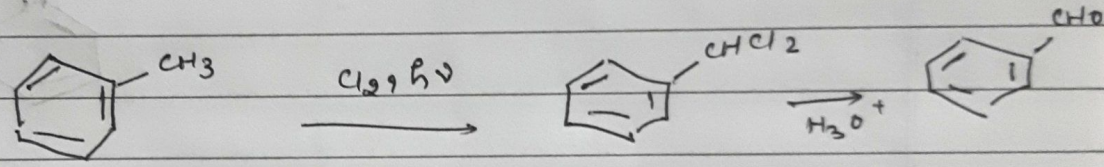
(B) By oxidation with $CrO_3/(CH_3CO)_2O$



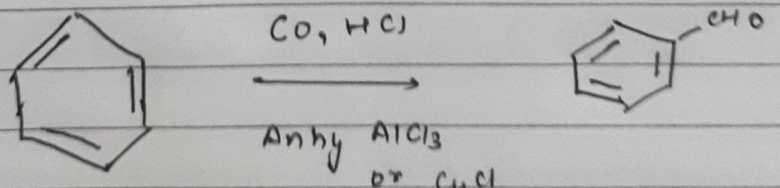
(2.) By Side Chain Chlorination followed by hydrolysis



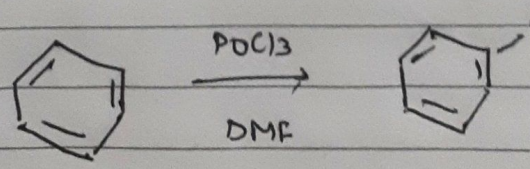
Benzal chloride

(3.) From Benzene:

(A) GATTERMANN-KOCH : CO, HCl anhy $AlCl_3$



(B) VILSMEIER-HAACK : $POCl_3$, DMF



SPECIAL PREPARATION OF KETONES

(1). From Acid Chlorides :

$RMgX$, $CdCl_2$
↓
Grignard

$$2RMgX + CdCl_2 \longrightarrow R_2Cd + 2MgXCl$$

$$2R'COCl + R_2Cd \longrightarrow 2R'COR + CdCl_2$$

(R_2Cd: Milder than Grignard Reagent)

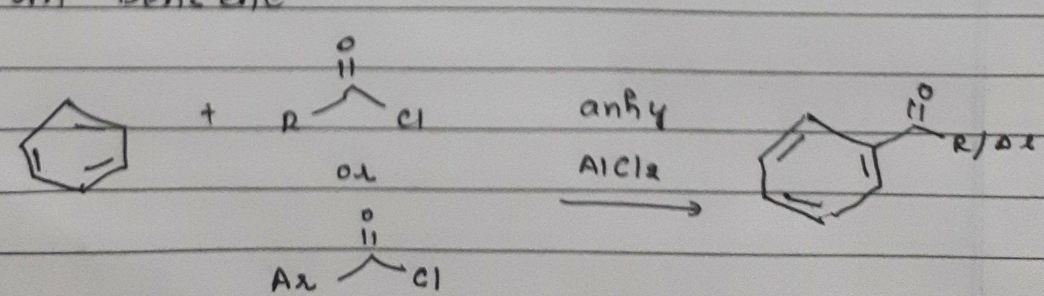
(2.) From Nitriles :

$$R-C\equiv N + R'MgX \longrightarrow R(C{=}N{-}MgX)R' \text{ (KETIMINE)}$$

$$\downarrow H_3O^+$$

$$RCOR'$$

(3.) From Benzene :



Friedal Craft Reaction