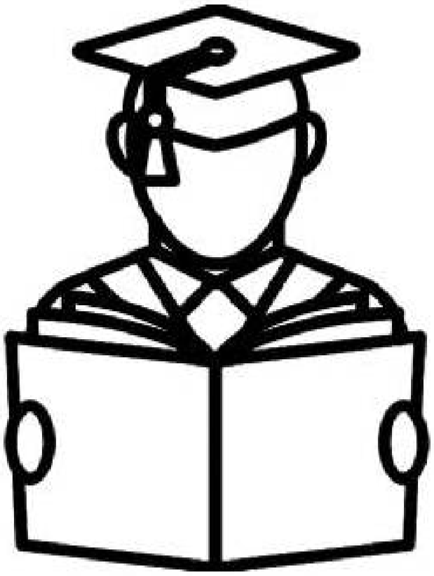
चौधरी PHOTOSTAT

"I don't love studying. I hate studying. I like learning. Learning is beautiful."



"An investment in knowledge pays the best interest."

Hi, My Name is

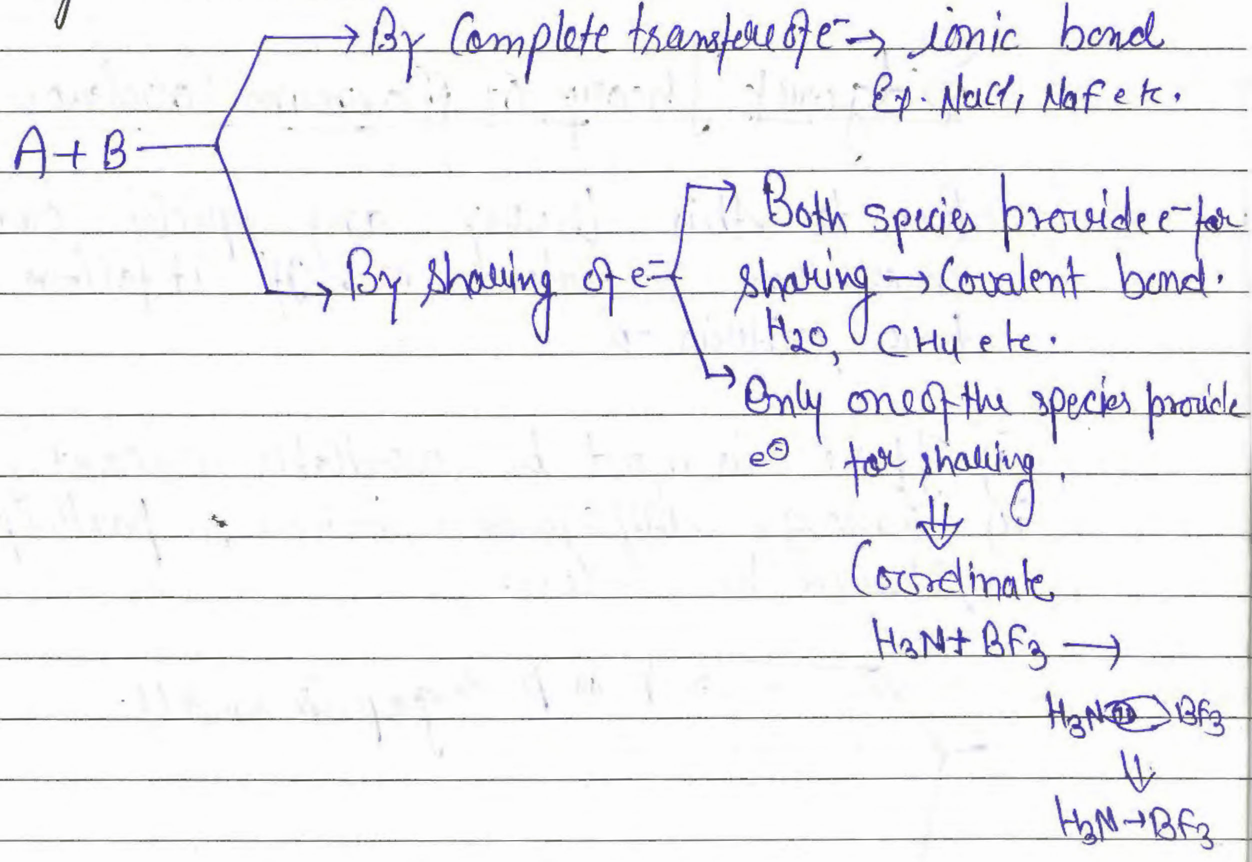
Chemistry (CY)
for JAM
(Career Endeavour)

Bond =>

It is a kind of force that holds two or more than two atoms for group of atoms.

Any species undergo bond formation in order to attain a stability. This stability is due to increase in nuclear force of attraction over the e⁻.

Modern Concept of bonding was initiated by Lewis and Langmuir.



Lewis Octet Theory →

Acc. to this theory any species undergo bond formation in order to complete its octet.
Eg. NH_3, CH_4, H_2O etc.

However, this theory was unable to explain bonding in and hypovalent as well as hypervalent species.

☆☆ (Sp. having 8 valence e^- → e^- precise Sp.)

Sidgwick Theory of Maximum Covalency →

Acc. to this theory any species can have more than 8 valence e^-. If it follow .. following two criteria →

i) There is must be available vacant d-orbital.
ii) Energy diff/separation between participating orbital should be less.

S-p, or p-d gap is small.

S-d gap is large.

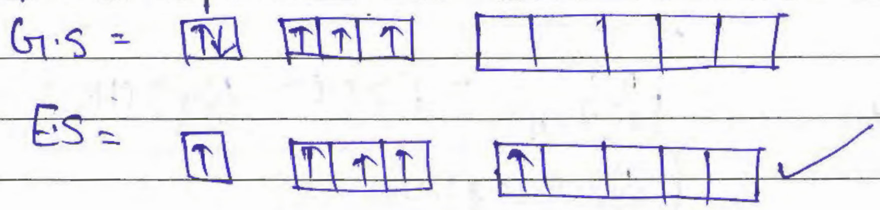
↓

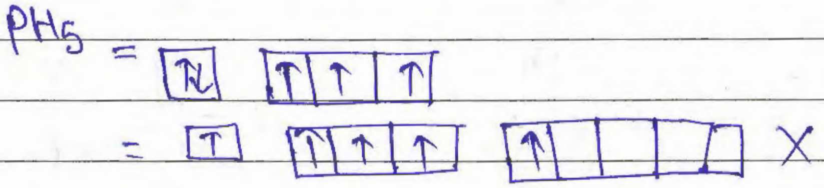
this gap can be compensated by attaching more E.N element on central atom.

In +nce of more EN element there is generation of partial positive on central atom, hence ↑ in nuclear force of attraction lean to ↑ in bond strength as well as bond energy.

In case of PF_5 bond energy of P-F bond is such that it can compensate energy requaried excitation of se^- to d-orbital.

$P = 3s^2 3p^3$



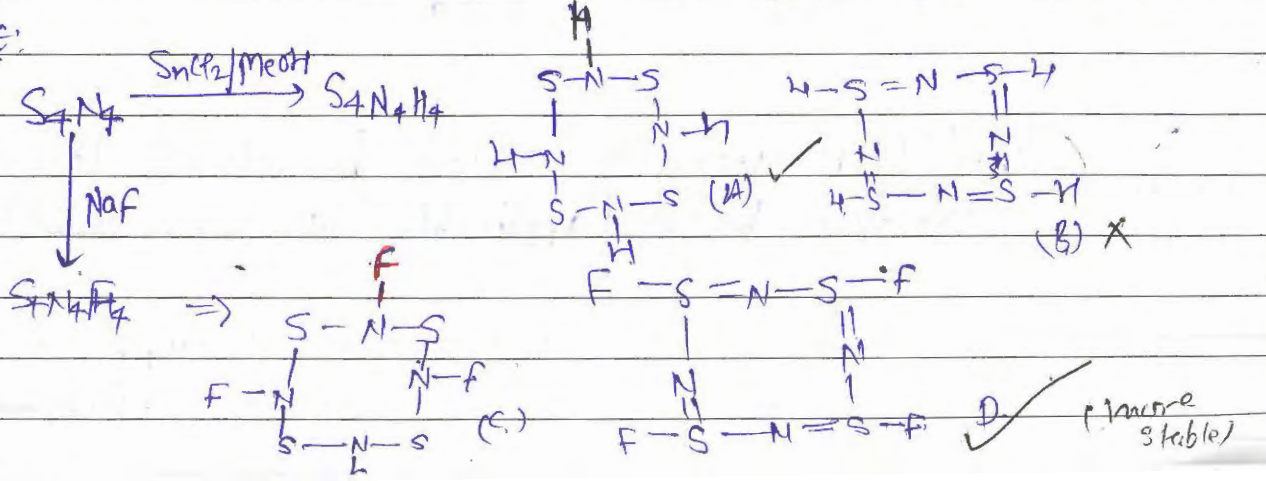


Imp

- PH_5 ✗
- SH_2 ✓
- OH_2 ✓
- SH_4 ✗
- OH_4 ✗

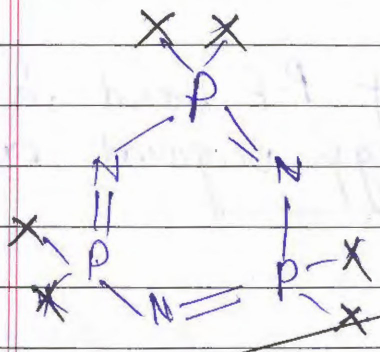
- PF_5 ✓
- PCl_5 ✓
- PBr_5 ✓
- SCl_4 ✓
- SF_6 ✓
- SCl_6 ✗

Q JAM|GATE:



Arrange the following ligands/ substituents w.r.t increasing order of $P\cancel{=}N_{\pi}$ bond strength in $N_3P_3X_6$ molecule

$(X = F, Cl, CH_3, Br)$



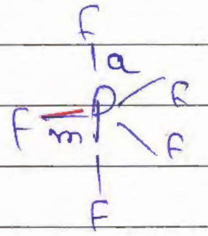
$\boxed{F > Cl > Br > CH_3}$

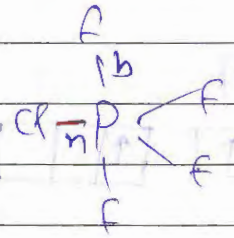
$\boxed{P-N \text{ bond length} = CH_3 > Br > Cl > F}$

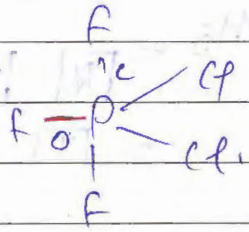
$\boxed{\nu_{P-N} = F > Cl > Br > CH_3}$

(Stretching frequency)

In case of more EN: d-orbital of P participate in bonding so,







$(P-F)_{axial}$ Bond length $= c > b > a$.

$(P-F)_{eq}$ " " $= o > n > m$

Sir

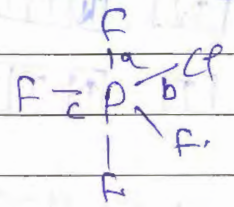
{ (P-F) → c में बड़ा है इसलिए axial bond strength low B.L ↑.

(P-F) → b → Cl

(P-F) → में Fluorine

Maxm B.S

Minm B.L



$a > C$
$b > a$ } (B.L)

In TBP geometry axial bonds are larger than equatorial bonds (applicable for same substituents)

In TBP Geometry more EN occupy axial position while more e⁻ positive occupy equitorial position.

unsymmetrical Environment.

PF_4CH_3 (a) $PF_3(CH_3)_2$ (b) $PF_2(CH_3)_3$ (c)

(P–F) axial bond length order.

⇒ c>b>a

★★ ⇒ (P–C) equitorial bond length order.

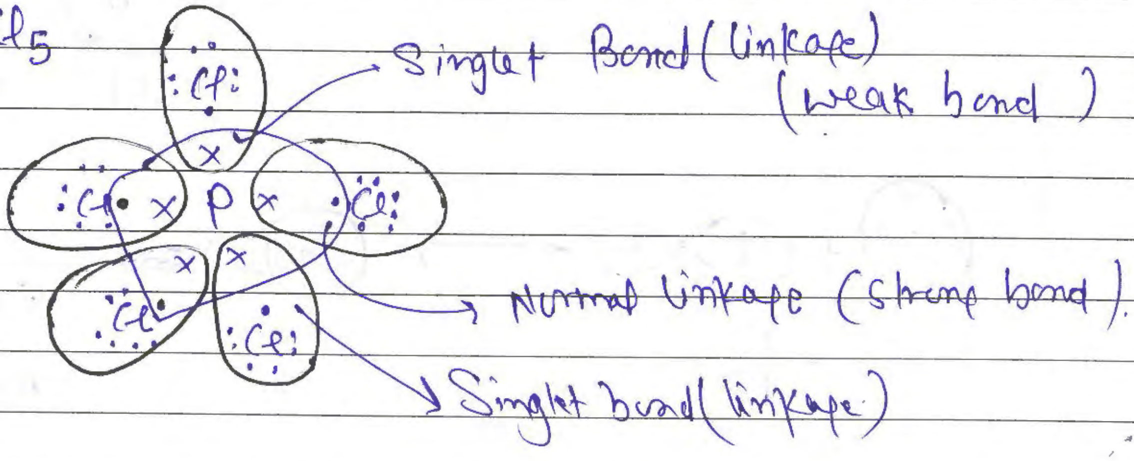
c>b>a.

Singlet Linkage Theory ⇒

Given by Sudgen, ⇒

This theory was in support with Lewis Octet Theory. Acc. to this theory there cannot be more than 8e⁻ in any species. If it is so, then there is formation of singlet Linkage.

PCl_5



$$PCl_5 \xrightarrow{\Delta} PCl_3 + Cl_2$$

$$SF_6 \xrightarrow{\Delta} SF_2 + 2F_2 \quad X$$

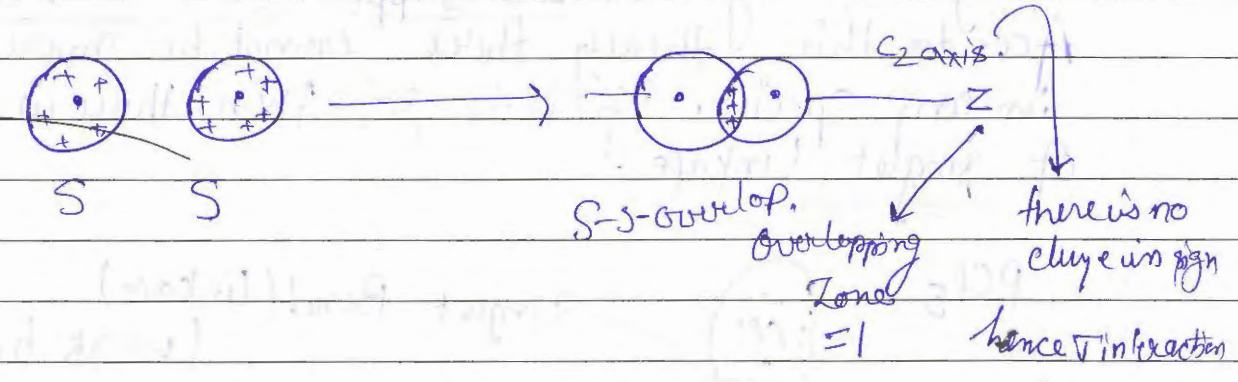
So, this is also regarded wrong later.

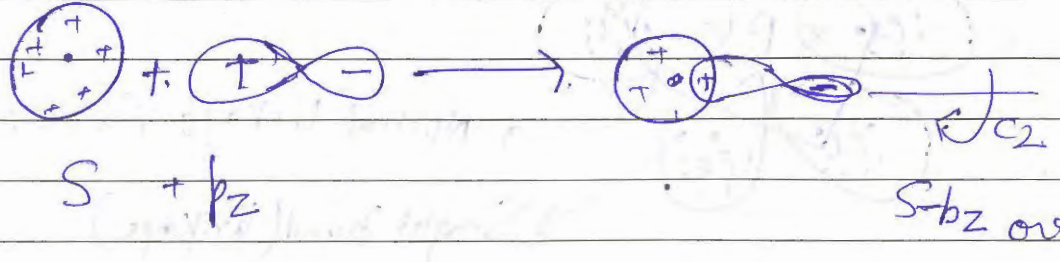
Concept of overlapping of atomic orbitals & types of bond ⇒

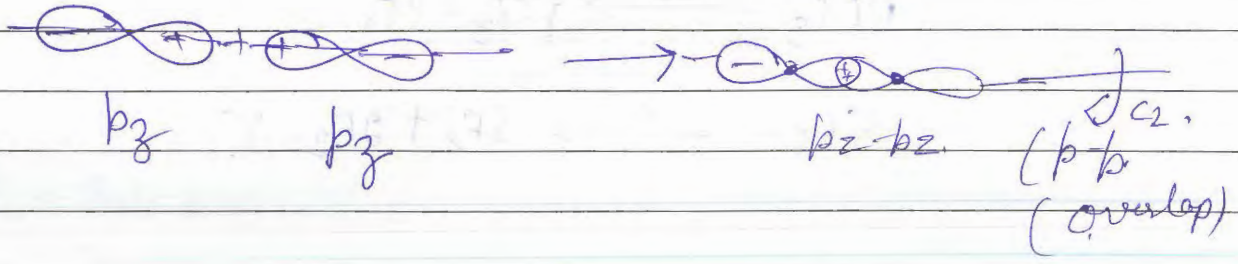
Acc. to this Concept, overlapping of atomic orbitals of two or more than two species. Leads to formation of a bond.

Depending upon direction of overlap of atomic orbitals following types of bond have been suggested.

σ - bond ⇒ (Head to Head or tail to tail overlap) :⇒







Prakash Sir Ji

Chemical Kinetics

Rate of Rxn

- ⇒ Rate Expansion
- ⇒ Order of Rxn } ★★★ ★★★
- ⇒ Integerated rate of Rxn }
- ⇒ Special Cases of Ist. order Rxn

Mechanism

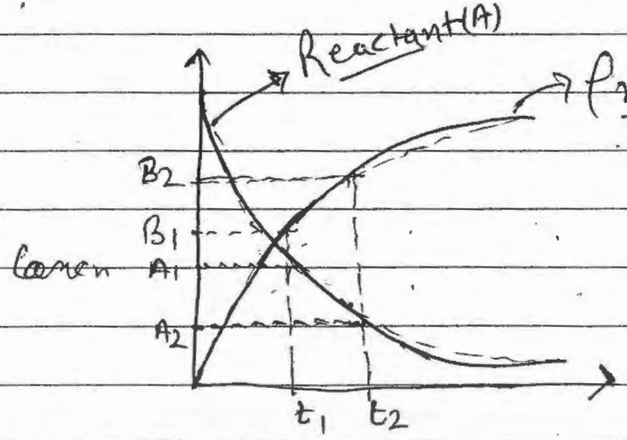
{ Arrhenius } ★★★ ★★★

Collision

Activated Complex Theory

Enzyme Catalysis

⇒ It is study of Rate of Rxn and the mechanism involved in the Rxn.



Rate of Consumption = $\frac{\text{Chnge in Concn of A}}{\text{Time taken}}$

$$= -\left\{\frac{[A]_2 - [A]_1}{t_2 - t_1}\right\}$$

$$= -\left\{\frac{\Delta[A]}{\Delta t}\right\}$$

Rate of formation of B = $\frac{\text{Change in Concn of B}}{\text{Time taken}}$

$$= \frac{[B]_2 - [B]_1}{t_2 - t_1}$$

Rate of formation of B = $\left\{\frac{\Delta[B]}{\Delta t}\right\}$

$$\boxed{\text{Rate of Rxn} = \frac{1}{a}\underbrace{\left\{-\frac{\Delta[A]}{\Delta t}\right\}}_{\text{Rate of Consumption}} = \frac{1}{b}\underbrace{\left\{\frac{\Delta B}{\Delta t}\right\}}_{\text{Rate of formation.}}} \Rightarrow \text{Rate of Rxn.}$$

Instantaneous Rate of Rxn :⇒

$$\frac{dA}{dt} = \frac{1}{a}\left\{\frac{-d[A]}{dt}\right\} = \frac{1}{b}\left\{\frac{d[B]}{dt}\right\}$$

$$\boxed{\begin{array}{l}\text{Unit of Rate of Rxn} = \text{Concn sec}^{-1} \\ \qquad\qquad\qquad\qquad \text{Mole L}^{-1}\text{s}^{-1}\end{array}}$$

Q-2 $$\text{rate} = \frac{1}{16}\left\{\frac{-d[H^+]}{dt}\right\} = \frac{1}{2}\left\{\frac{-d(MnO_4^-)}{dt}\right\}$$

$$= \frac{1}{10}\left\{\frac{-d[I^-]}{dt}\right\} = \frac{1}{2}\left\{\frac{d(Mn^{2+}]}{dt}\right\} = \frac{1}{8}\left[\frac{d(H_2O)}{dt}\right]$$

$$\frac{1}{2}\frac{d[Mn^{2+}]}{dt} = \frac{1}{5}\frac{d[I_2]}{dt}$$

$$\frac{d[Mn^{2+}]}{dt} = \frac{2}{5}\frac{d[I_2]}{dt}$$

Q-3 $3.6 \times 10^{-3} = 4 \times$ Rate of Rxn.

$.9 \times 10^{-3} =$ Rate " "

(d) ✓

Q-6 $\frac{200}{250}$ 1 atm = 760 mmHg

$= \frac{\cancel{4}}{5} \frac{\text{mmHg}}{\text{sec} \times \cancel{760}\, 190}$

$\frac{1}{5 \times 190 \times 100} \times 100$

$\frac{100}{95} \times 10^{-3} = 1.05 \times 10^{-3}$

- Unit in terms of Pressure = $atm\,s^{-1}$ or $bar\,s^{-1}$
- Relation b/w r_c & r_p for Gaseous Rxn.

$$P.V = nRT \qquad P = \frac{n}{V}RT$$

$$\Delta P = \Delta CRT$$

$$\frac{\Delta P}{\Delta t} = RT\frac{(\Delta C)}{\Delta t}$$

** $\boxed{r_P = RT r_c}$

Unit Conversions ⇒

i) Pressure

⇒ S.I → Pascal (Pa)

$\boxed{\begin{array}{l} 1atm = 1.01325 \times 10^{5}\,Pa \\ 1bar = 10^{5}\,Pa \end{array}}$

$\boxed{1atm = 760\,mm\,Hg.}$

$\boxed{1torr = 1mm\,Hg}$

2) Volume

⇒ S.I → m^3.

$1L = 1dm^3 = 10^{-3}m^3 = 10^{3}cm^3$.

3) Gas Constant ⇒ R

S.I value = 8.314 [redacted] $J\,K^{-1}\,mol^{-1}$.

→ $R = .0821\ atm\,L\,K^{-1}\,mol^{-1}$.

→ $= .0831\ bar\,L\,K^{-1}\,mol^{-1}$.

Relation b/w Rate of consumption & Rate of formation in terms of Mass time!:

$$aA \longrightarrow bB$$

$$\text{rate} = \frac{1}{a}\left\{\frac{-d[A]}{dt}\right\} = \frac{1}{b}\left\{\frac{dB}{dt}\right\}$$

$$\frac{1}{a}\left\{\frac{-d[A]}{dt}\right\} = \frac{1}{a}\left\{\frac{-d}{dt}\left(\frac{nA}{V}\right)\right\} = \frac{1}{aV}\left\{\frac{-d}{dt}(nA)\right\}$$

$$= \frac{1}{aV}\left\{\frac{-d}{dt}\left(\frac{wA}{MA}\right)\right\} = \frac{1}{aV_{MA}}\left\{\frac{-d(wA)}{dt}\right\}$$

$$\text{rate} = \frac{1}{aV\,MA}\left\{\frac{-dwA}{dt}\right\} = \frac{1}{bXM_B}\left\{\frac{dw_B}{dt}\right\}$$

$$\boxed{\underbrace{\frac{1}{aM_A}\left\{\frac{-dw_A}{dt}\right\}}_{\text{Rate of Rxn in Mass time!}} = \underbrace{\frac{1}{bM_B}\left\{\frac{dw_B}{dt}\right\}}_{\text{Rate of Rxn in Mass time!}}}$$

Law of Mass Action ⇒

$aA + bB \longrightarrow cC + dB$

$\text{rate} \propto [A]^a [B]^b$

$= K[A]^a[B]^b$

In General $\boxed{\text{rate} = K[A]^x[B]^y}$ ⇒ Rate law or Rate Equation or Rate Expression.

K = Rate Constant or Specific Constant.
x = Order w.r.t Reactant A.
y = Order w.r.t " B.

$\{x+y = \text{Order of Rxn.}\}$

*** K ⇒ Depends upon temperature & independant of Concn of reactant.

Order Represents how sensitive the Rate of Rxn is w.r.t the Concn of Reactant.

Coordination Chemistry

1 Introduction

2 Theories of Bonding in Coordination Complex
→ Valence Bond Theory.
→ Crystal field Theory
→ Molecular Orbital Theory

3 Colour & Electronic Spectra

4 Magnetism

5 Reaction Mechanism in Coordination Complexes

⇒

When a solution of two or more salts are allowed to evaporate then their crystal is observed.
On the basis of property of crystal, there are two types of compounds

$$A+B+C \longrightarrow \text{Crystal} \begin{cases} \rightarrow \text{Double Salt} \\ \rightarrow \text{Coordination Compound} \end{cases}$$

Double Salts:- All the ions loose their identity in water or other solvents.
Eg. Mohr's Salt - $(NH_4)_2 SO_4 \cdot FeSO_4 \cdot 6H_2O$.

Carnalite $KCl \cdot MgCl_2 \cdot 6H_2O$
$K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$ (Potash Alum)

Coordination Compound
⇒ All the ions do not loose their identity.

$$NiCl(aq) + NH_3 \downarrow [Ni(NH_3)_6]Cl_2$$

Crystal

$$\downarrow H_2O$$

$$2Cl^{\ominus} + [Ni(NH_3)_6]^{2+}$$

Representation of Coordination Compound :⇒

Metal ion ← → Ligand

$K_4[Fe(CN)_6]$ → Coordination no.

Coordination Sphere

$$M \leftarrow L$$

L·Acid L·Base

Ligands and their Classification ⇒

Any species that can donate at least one lone pair.

Classification ⇒

A) On the basis of no. of donar atom ⇒ (Denticity)

1) Monodentate ⇒

Binds with metal with single donar atom.

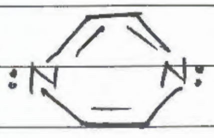
$\ominus$vely charged

Cl^- Chlorido
F^- fluorido
Br^- Bromido
I^- Iodo
NO_3^- Nitrato
NO_2^- Nitrito-N
$-\bar{O}NO$ Nitrito-O
O^{2-} Oxido
O_2^- → Superoxo
O_2^{2-} → Peroxo
NH_2^- → Amido
NH^{-2} → Imido
N^{3-} → Nitrido
N_3^- → Azido
ClO_4^{-2} → Perchlorato
SO_4^{2-} → Sulphato
PO_4^{3-} → Phasphato
AsO_4^{3-} → Arsenato
CO_3^{2-} Carbonato

$OH^{\ominus}$	Hydroxo
H^-	Hydrido
S^{2-}	Sulfido
SO_3^-	Sulphito
$C_2H_5O^-$	ethoxo
CH_3O^-	methoxo
✓ $-\bar{S}CN$	thiocyanato-S
✓ $-NCS$	thiocyanato-N ⇒ (isothiocyanato)
$-\bar{C}NO$	Cyanato
$-CN$	Cyano

Neutral ⇒

CO →	Carbonyl
CS	thiocarbonyl
NO	Nitrosyl
NS	thionitrosyl
H_2O	aqua
N_2	Dinitrogen
O_2	dioxygen
✓ CH_3-NH_2	Methylamine
CH_3-CN	Methyl Cyanide
PPh_3	Triphenyl phosphine
$C_2H_5OC_2H_5$	diethyl ether
NH_2-NH_2	hydrazine



Pyrazine (Pz)

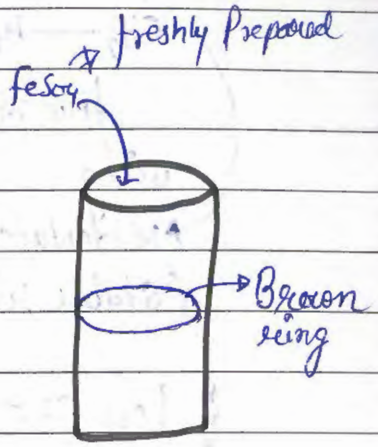
Pyridine (Py)

* Imp Q ⇒ NO ligand ~~doesn't~~ Exist as NO^+ with fe compound.

$$[Fe(H_2O)_5(NO)]^{2+}$$

$$\downarrow$$

Complex is responsible for Brown ring in NO_3^- test.



$fe \Rightarrow fe^{+1} = [Ar]3d^{6}4s^{2} \Rightarrow fe^{+1} = d^{7}$.

?

$[Fe(CN)_5(NO)]^{2-}$ ⇒ Nitroprusside ion $\xrightarrow{\quad}$ $[Fe(CN)_5(NOS)]^{4-}$

⇒ +2

(red colour)

$(NH_4)_2S$

or

Reagent ⇒ $H_2S \rightleftharpoons 2H^+ + S^{2-}$

Purple Colour

$S^{2-} \longrightarrow \overset{\oplus}{N}\equiv O \longrightarrow \overset{\ominus}{S}-N=O$

thionitrite

2) Bidentate ligand ⇒

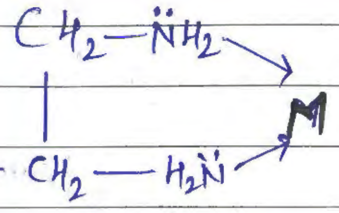
binds with metal via 2 donar atoms.

$H_2\ddot{N}-CH_2-CH_2-\ddot{N}H_2$ ⇒ ethylene diamine ⟶ (en)

⇓

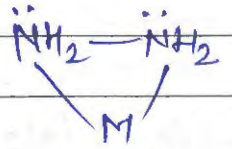
Organic amine

(Oxine)
8-hydroxy
Quinilato



five membered ring.
→ Bidentate
(Stable ring)

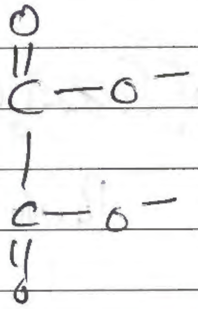
⁂ Less Strain



3-Membered

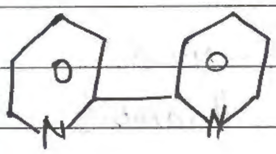
Bidentate
(unstable ring)

High strain ∴ don't act as Bidentate.



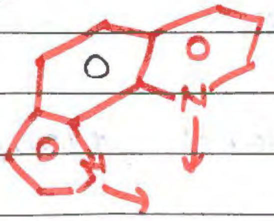
Oxalato (OX)

Sir ⇒



bipyridyle (bipy) or (bpy)

Imp Ques



O-phenathreinline ⇒ (O-phen or phen)

$$[Fe(phen)_3]^{2+} \xrightarrow[O.\ Agent]{in\ +nce\ of} [Fe(phen)_3]^{3+} + e^-$$

Blue colour

Electrochemistry

Conductance   Galvanic Cell

Conductance ⇒

Conduction ⇒

It is the flow of Current through wire and electrode. ~~in~~ (metallic Conductor). or through the solution
⇓
Electrolytic Conductance

→ In metallic Conductor, Current flow due to the flow of e.
→ " Electrolytic " " " " " " " ion.

Mechanism of Electrolytic Conduction ⇒

An electrolyte dissociate into active molecules (under the influence of electric field, one active molecule move toward $\ominus$ve terminal
⇒ Called Cation.

→ And Another molecule moves toward $\oplus$ve terminal & is called anion.

→ Conduction of ion depend on the rate of flow of ion. (velocity or mobility)

mobility = velocity per unit Electric field.

→ Higher the mobility, Higher the Conductance.

Ohm's law ⇒

$$I \propto V$$
$$I = \frac{V}{R} \quad , \boxed{V = IR}$$

V :→ Potential Applied

I :→ Current flow through the Conductor.

R :→ Resistance (Obstruction to the flow of Current)

$$R \propto \frac{l}{A}$$

$$R = \rho\frac{l}{A}$$

ρ → Resistivity or Specific Resistance.

↳ Resistance of 1cm^3 of Conductor or solution.

Conductance (G) :⇒

↳ It represents the ease by which current can flow to the Conductor.

It is the inverse of Resistance. $G = \boxed{\frac{1}{R}} = \frac{1}{ohm} \Rightarrow ohm^{-1}$ or Ω^{-1}.

⇒ It is the measure of degree to which Conductor can conduct Electricity.

⇒ Higher the Conductance, Higher the Conduction. -

★★★★ S.I unit ⇒ 1 Siemen (S) = 1 Ω^{-1} = 1 mho.

Conductivity or Specific Conductance (K)

It is the Conductance of 1 cm^3 of Soln. or 1 (unit)^3 of Soln.

$$K = \frac{1}{\rho}$$

$$\left\{ \begin{aligned} &\boxed{K = \frac{1}{R}\frac{l}{A}} \\ &K = G \cdot \boxed{\frac{l}{A}} \xrightarrow{} \text{cell Constant.} \end{aligned} \right\} \Rightarrow ★★★★★★$$

- Theoretically Cell Constant i.e. $\left(\frac{l}{A}\right)$ does not chnge with Concn

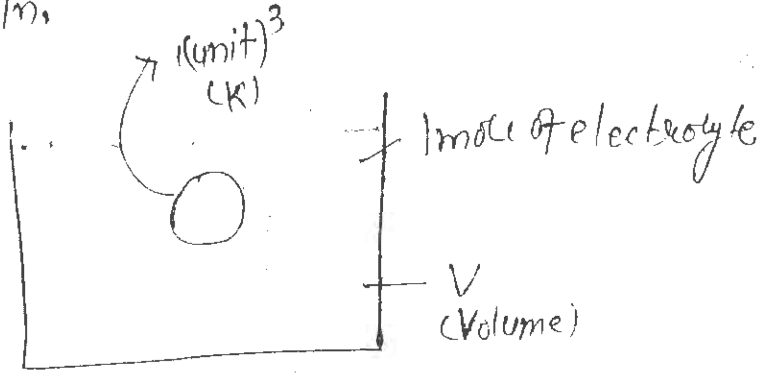
But experimentally it was found out ~~that~~ Cell Constant

Sir does chnge due to Contamination of electrode, temperature etc.

$$\boxed{\begin{array}{l} S.I\ unit \Rightarrow 1\,Sm^{-1} = 1\,\Omega^{-1}m^{-1} = 1\,mho\,m^{-1} \\ Common\ unit \Rightarrow 1\,S\,cm^{-1} = 1\,\Omega^{-1}cm^{-1} = 1\,mho\,cm^{-1} \end{array}}$$ ***

Molar Conductivity (Λ_m) ⇒

It is the Conductance of 1 mole of an electrolyte dissolved in V volume of Soln.



$1(unit)^3 \longrightarrow K$

$V(unit)^3 \longrightarrow K.V = \Lambda_m$

$V = \frac{1}{Molarity}$

Molarity: $\frac{no.\ of\ moles}{vol(L)} = \frac{1}{V}$

$$\Rightarrow \boxed{\Lambda_m = \frac{k(Sdm^{-1})}{Molarity(mol dm^{-3})}}$$

If k is in Siemens cm⁻¹.

- $\Lambda_m = \frac{k(Scm^{-1})}{M(mol}$

$$\boxed{\Lambda_m = \frac{K \times 1000}{\text{ⓜ}}}$$ ⓜ → Malarity.

If (Siemen cm^{-1}) ⇒ K

$\left\{ \begin{matrix} \text{1 cm m} \\ 10^{-1} \\ m^3 \; 10^{-1} \\ 10^{-3} \end{matrix} \right\}$

(If $\overset{K}{\cancel{\text{Siememen}}}$ = Siemen m^{-1})

= Siemen m^{-1}

$$\boxed{\Lambda_m = \frac{K}{M \times 1000}}$$ ⇒ {when K ⇒ Siemen m^{-1}}

$$\Lambda_m \rightarrow \frac{\text{Siemen cm}^{-1} \times 100}{\text{Mole} \times \underset{\hookrightarrow m^{-3}}{L^{-3}}} = \underline{1 \text{ Siemen } m^2 \text{ mole}^{-1}}$$

Equivalent Conductivity (Λ_{eq})

It is the conductance of 1gm eq. of an electrolyte dissolved in V volume of solution.

$CaCO_3 \longrightarrow Ca^{2+} + CO_3^{2-}$ $Z = 2$.

$NaCl \longrightarrow Na^{+} + Cl^{-}$. $Z = 1$

$CaCl_2 \longrightarrow Ca^{2+} + 2Cl^{-}$ $Z = 2$

$\left\{ \frac{wt}{eq.wt} = \right\}$ $\quad$ $g.eq = \frac{n \times \text{Molar Mass}}{\text{Eq.wt}}$

$\left\{ \underline{\text{Eq wt}} = \frac{\text{Given Mass}}{\frac{n}{Z}} \right\}$

$$n = \frac{\text{Given Mass}}{\text{Molar Mass}} = \frac{\text{Given Mass}}{Z\ \text{Eq. wt}}$$

$$n = \frac{\text{gm equivalent}}{Z}$$

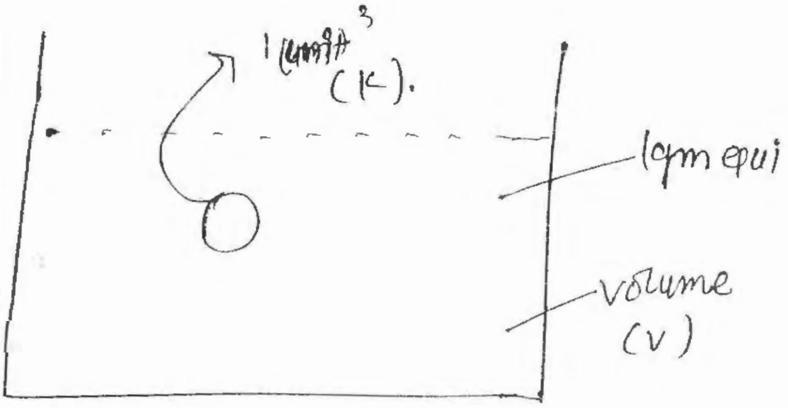
$$\boxed{Z \cdot n = \text{gm Equivalent}}$$

Λm

$$\Lambda_{eq} = \frac{K \times 1000}{M \times n\text{-factor}}$$

$$\boxed{\Lambda_{eq} = \frac{\Lambda m}{Z\ \text{factor}}}$$

It is the amount of substance deposited or liberated on passing one mole of e⁻ or 1F to the solution.



$$1(\text{unit})^3 \longrightarrow K$$

$$v(\text{unit})^3 \longrightarrow Kv = \Lambda_{eq}$$

$$\text{Normality} = \frac{\text{No. of g. eq}}{\text{vol. (L)}}$$

$$\Lambda_{eq} = \frac{K}{\text{Normality}} \quad (K \text{ is in } S\,dm^{-1})$$

K is in S cm⁻¹.

$$\Lambda_{eq} = \frac{K \times 1000}{\text{Normality}} \quad \left(\frac{K \times \cancel{1000}}{\text{Normality} \times 1000}\right) \Rightarrow K = \text{in } S\,m^{-1}$$

$$\boxed{\Lambda_{eq} = \frac{\Lambda m}{Z\text{-factor}}}$$

$$K = \frac{1}{R}\frac{l}{A}$$

MTR

$$\Lambda_m = \frac{k \times 1000}{\text{Molarity}}$$

$$\Lambda_{eq} = \frac{k \times 1000}{\text{Normality}}$$

$$\Lambda_m = Z\Lambda_{eq}$$

The resistance of 0.01N soln of an electrolyte is 210 ohm. If the cell const of .88 cm⁻¹ Cal. Eq. Conductivity of soln.

$\boxed{\frac{l}{A}}$

$$K = \frac{1}{R}\frac{l}{A}$$

$$= \frac{1}{210} \cdot 88$$

$$\Lambda_{eq} = \frac{.88 \times 1000}{210 \times \text{Normality}}$$

$$\Lambda_{eq} = \frac{.88}{210 \times .01} \times 1000$$

$$= \frac{88}{21\cancel{0}} \frac{\times 100\cancel{0}}{1}$$

$$= \frac{8800}{21} = 419.0 \left(S\ cm^{-1}\right)$$

EQUILibrium

Sub Topic (Mole Concept & Stochiometry)

JAM

Buffer
Solubility
Hydrolysis

Titration (Indicator)
Table:
ranges

Mole Concept ⇒

1 gm atom = 1mole = NA particle
1 gm molecule = 1mole = " " .

$$\boxed{\text{No. of moles} = \frac{\text{Given Mass}}{\text{Molar Mass}} = \frac{\text{No. of Particle}}{\text{NA}}}$$ ~~+++~~ Imp

▷ for Gas at STP ⇒ moles = $\frac{\text{Vol. of Gas (Ltr)}}{22.4}$

Eg. $A_2B_3 \longrightarrow$ 2 mole of A & 3 mole of B
= 2x molar Mass of A & 3x Molar Mass of B (in gm)

Ass/
Q.6 $Cl^- = 222g$ & $Ca^{2+} = 222g$.

$n = \frac{222}{111} = 2$ moles.

⇒ 1 mole of $CaCl_2$ → 1 mole of Ca^{2+} & 2 moles of Cl^-.
⇒ 2 " " " ⇒ 2 mole " " " 4 mole of Cl^-.
= 2 NA " " " 4×NA " " " ".

Q.5 200mg of CO_2 = .2g of CO_2
Imp

$nCO_2 = \frac{.2}{44} = 4.5 \times 10^{-3}$

10^{21} mole are removed.
Remaining nCO_2 = ...???

$$n(CO_2)_{\text{removed}} = \frac{\text{No. of molecules removed}}{6.022 \times 10^{23}}$$

$$= \frac{10^{21}}{6.022 \times 10^{23}} = .00166 \text{ moles.}$$

$$= 1.66 \times 10^{-3} \text{ mole}$$

$$(nCO_2)_{\text{remaing}} = 4.5 \times 10^{-3} - 1.66 \times 10^{-3}$$

$$= (4.5 - 1.66) \times 10^{-3}$$

$$= .0028 \text{ mol.}$$

Q.7 $H_3PO_4 = 4.9g$

$$n_{H_3PO_4} = \frac{4.9}{98} = \frac{1}{20}$$

$98g \longrightarrow 64g$ of O_2

$4.9g \longrightarrow \frac{64}{98} \times 49 = 3.2g$ of O

$$n_O = \frac{3.2}{16} = 0.2.$$

Laws Related to Stochiometry ⇒

1. Low of Conservation of Mass ⇒

It states that during the Course of reaction mass is neither created nor destroyed.

$$A + B \longrightarrow x + y$$

$$xg \quad yg \qquad zg \quad ag$$

Acc. to Low of Conserevation of Mass $= (x+y)g = (z+a)g.$

Ex. $H_2 + \frac{1}{2}O_2 \longrightarrow H_2O.$

$$2g \quad 16g \quad \rightarrow 18g.$$

Q. 3g of ethane uncomplete Combustion gives 8.8g of Carbon dioxide & 5.4g of H_2O. Show that result are in accordance with the low of C.O.M.

$C_2H_6 + \frac{7}{2}O_2 \longrightarrow 2CO_2 + 3H_2O$

CO_2 ⇒ 44g of CO_2 ⟶ 12g of C

88g ⇒ $\frac{12}{44} \times 88 = 2.4$ of C.

H_2O ⇒ 18g of H_2O ⟶ 2g of H.

5.4 " " " = $\frac{2}{18} \times 5.4 = 0.6$ of H.

2.4 of C + .6g of H = 3g of C_2H_6.

Assignment-1

Q-1 Hydrocarbon + $2O_2 \longrightarrow CO_2 + H_2O$

.22g   .44g   .9

In CO_2

44g of CO_2 ⟶ 12g of C

.44g of CO_2 = $\frac{12}{44} \times .44 = .12$

Acc to law of C.O.M

$w_H + w_C = w_{HC}$

$w_H + .12 = .22$

$w_H = .10$

$\frac{.44}{44} = .01$ mol of CO_2

1 mol of CO_2 = 1 mole of C

.01 " " " = .01 mole of C

= .12g.

2. Law of Constant Composition ⇒

It states that ratio of an element in the Compound will always be same irrespective of the source of Compound.

. Ass-

Q.2 In FeS $\frac{Fe}{S} = \frac{7}{4}$

$w_{FeS} = ?$ $w_{Fe} = 2.8g$ Sulphur = ??

$$\frac{7}{4} = \frac{2.8}{S}$$

$\Rightarrow S = 1.6$

Conservation Of Mass = $Fe + S \rightarrow FeS$

$= 2.8 + 1.6 \rightarrow 4.4g$

$w_{FeS} = 4.4g$.

Q.3 Cupric oxide = 1.375 g

Copper = 1.098 g

Oxygen = 1.375 − 1.098

= .277

Now $\frac{Cu}{O} = \frac{1.098}{6.277}$

$w_{CuO} = ?$ $w_{Cu} = 1.179g$ of O = ??

$$\frac{1.098}{.277} = \frac{1.179}{w_O}$$

$$3.96 = \frac{1.179}{w_O}$$

$$w_O = \frac{1.179}{3.96} = .297$$ Ans.

Acc. to C.O.M ⇒

$w_{CuO} = w_{Cu} + w_O$

$= 1.179 + .297$

$= 1.476g.$

Q-4 $H_2 + \frac{1}{2}O_2 \longrightarrow H_2O$

In H_2O :-

$$\frac{H_2}{O} = \frac{112}{56} = 2$$

Now,

$$\frac{H_2}{O} = 2$$

$$\frac{224}{O} = 2$$

$$O = \frac{224}{2} = 112$$ Ans.

Q3. Low of Multiple Proportion ⇒

It states that two atom element combines together to form different compound then the wt of 1 element which combine with the fixed weight of a to other are in the ratio of simple whole no.

$$SO_2 \longrightarrow SO_3$$

32g of S ⟶ 32g of c

$$\frac{48}{32} = \frac{3}{2}$$

Q. Element X & Y to form two compounds in the first compound .324 X is compound with .471 g Y in the second compound 1.117 g X is combined with how many gm of Y i.e. Give the ratio of Y in both the compound is 1:3.

Ratio of Y in both Compound $= \frac{1}{3} = \frac{\text{Mass of Y in Ist Compound}}{\text{Mass of Y in 2nd Compound}}$

$.324\ gm \longrightarrow .471\ g\ Y$

$1g\ g \longrightarrow \frac{.471}{.324}\ g\ Y$

$.117\ x \longrightarrow x\ g\ Y$

$1\ g\ x \longrightarrow \frac{x}{.117}\ g\ Y.$

$\Rightarrow \frac{.471 \times .117}{.324 \times x} = \frac{1}{3}$

$x = \frac{.165}{.324}$

$= .51\ g$ of Y.

Q ⇒ An Element form two oxide, the ratio of element in oxide is 2:1. If the Ist oxide contain 1.12 l of O_2 at STP Then the amount of element in 2nd oxide ______ gm.
Given wt of oxide Ist is 2.9 gm

Two oxide $\frac{M_1}{M_2} = \frac{2}{1} = \frac{\text{Mass of M in Ist oxide}}{\text{Mass of M in 2nd oxide}}$

Ist oxide $O_2 = 1.12L$ at STP

wm in IInd oxide = ??

GOC → General organic Chemistry
- Resonance
- Inductive
- Hyperconjugation

→ Acidity
→ Basicity

↳ Aromaticity

(2) Reaction Mechanism
→ Bond breaking of Reactants (F.Group)
→ formation of Intermediates / T.State.
→ Bond formation of Product.

Types of Rxn
- Acid / Base Rxn
- Addition Rxn
- Substitution Rxn
- Elimination Rxn

3) Rxn Intermediates
- Carbocation
- Caranion
- free radical
- Carbene
- Nitrene
- benzene

H.W
→ F.G learn
→ Nomenclature
→ Types of Rxn acc to function group.

4 → Reagents

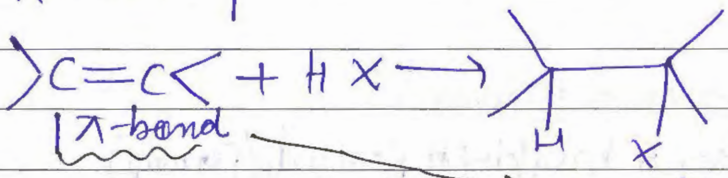
5) Name Rxns

Organic Chemistry

① Addition Reaction

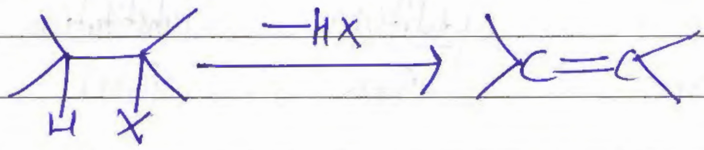
→ Exothermic

→ π e⁻ density



1π-bond → 2σ Always

2) Elimination Rxns



$2\sigma \longrightarrow \pi$ Endothermic — Always

More stable/less Energy

Less stable/More Energy

3) Substitution

$R-X + Nu^- \longrightarrow R-Nu + X^-$

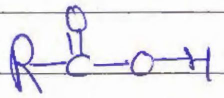
1σ breakup 1σ formation.

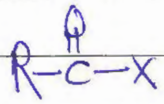
Functional Groups ⇒

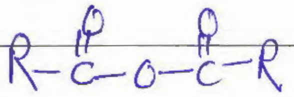
HCD

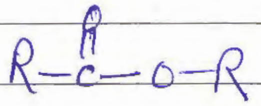
HC

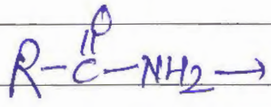
1 $R-SO_3H$ Sulphonic Acid.

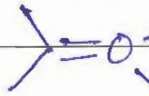
2 
$R-\overset{O}{\overset{\|}{C}}-O-H$ Acid


$R-\overset{O}{\overset{\|}{C}}-X$


$R-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-R$ Anhydride.


$R-\overset{O}{\overset{\|}{C}}-O-R$ ester.


$R-\overset{O}{\overset{\|}{C}}-NH_2 \rightarrow$ Amide


$>=O$ → Aldehyde
→ ketone.

$R-OH$ Alcohol

$R-SH$ Thiol

$R-C \equiv N$ Cyanide/nitrile.

$R-X$ - halide.

$R-O-R$ Ether

① Alkane

② Alkene

③ Alkyne

④ Aromatic

Homoaromatic

Heteroaromatic

$R-NH_2$ Amine

$R-NO_2$ Nitro

$R-N\equiv C$

X ↖R

Alkane ⟶ FRSR

X ↙O

Alkane ↖R

Alkene ⟶ EAR

Diol, Aldehyde ↙O

ketone, C.A

Epoxides ⇒ 

Alkane, Alkene ↖R Alkyne ⟶ EAR

Diol, Aldehyde ↙O

ketone, C. Acid

Epoxides.

↖R Aromatic Compound ⟶ ESR

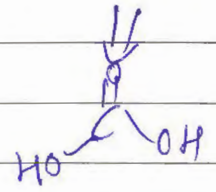
↙

Aldehyde, ketone ← R Carboxylic Acid → Esterification & decarboxylation Rxn

Alcohol

O ↙

CO_2 or H_2CO_3



Aldehyde, ketone ← R Acid Derivatives → NSR

Alcohol

O ↙

Alcohol ← R Carbonyl → NAR.

$>C=O$

C.A ← O

Alkene ← R Alcohol → NSR

→ Elimination

Aldehyde ← O

Ketones

C.A

(Strong O.A like $KMnO_4$)

Aldehyde ← R $R-C\equiv N$ → NAR

Ketone

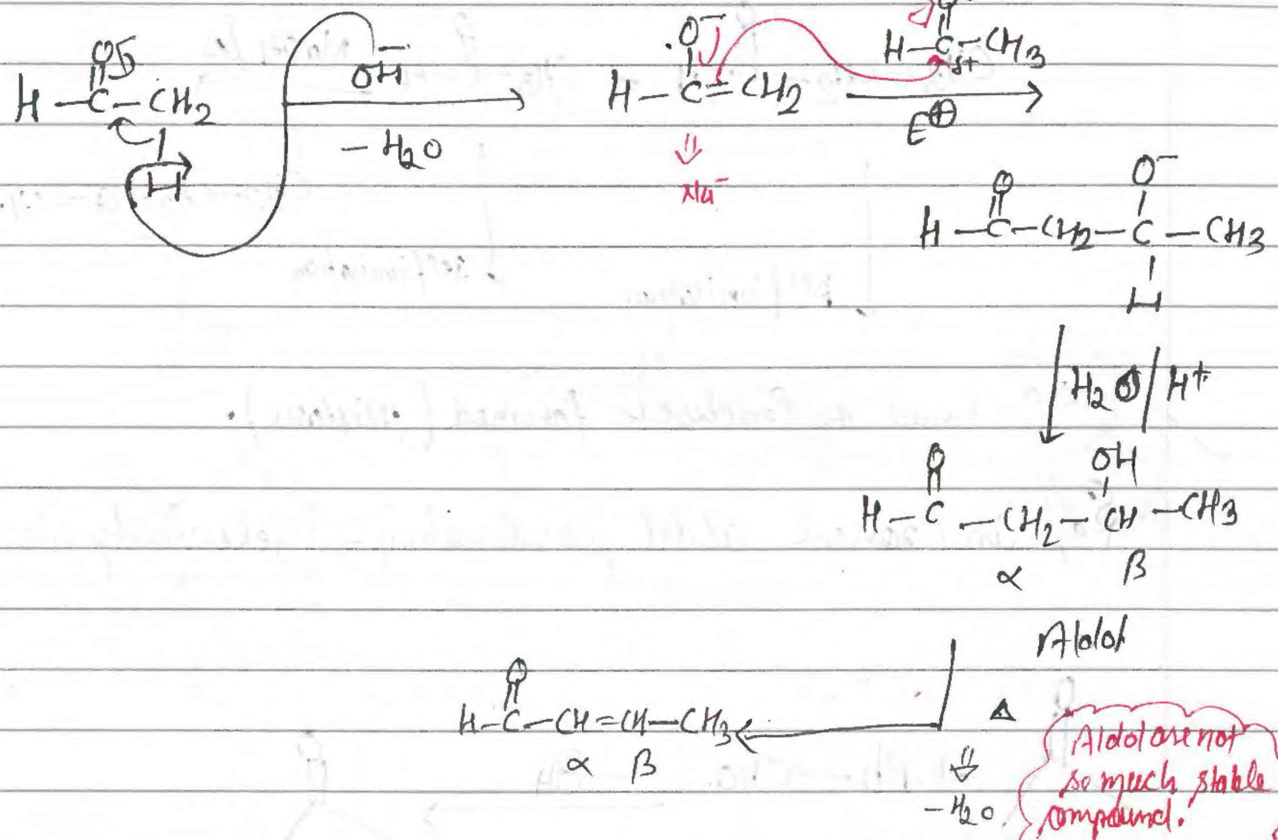
(1° amine)

O ↙

Acid.

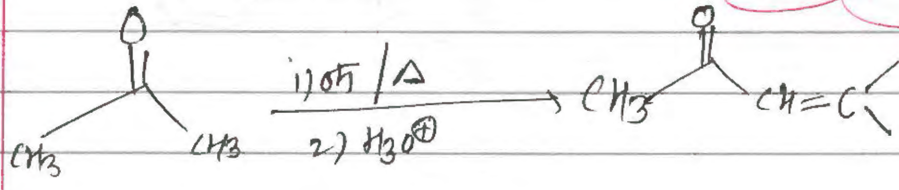
Aldol Condensation (low temp., in aliphatic Carbonyl Compound)

i) Self condensation

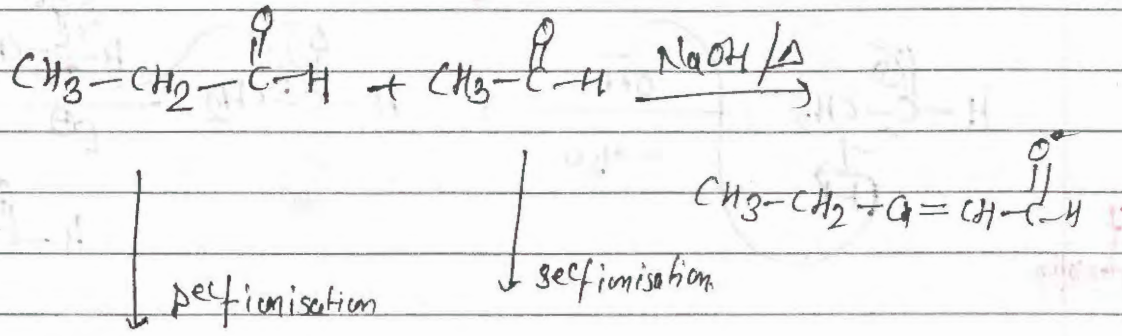


Aldol are not so much stable compound.

Trick exam
$-\underset{H}{\overset{\beta}{CH_3}}$ वाले को $-\overset{O}{\overset{\|}{C}}-$ के साथ double bond में convert कर दो।



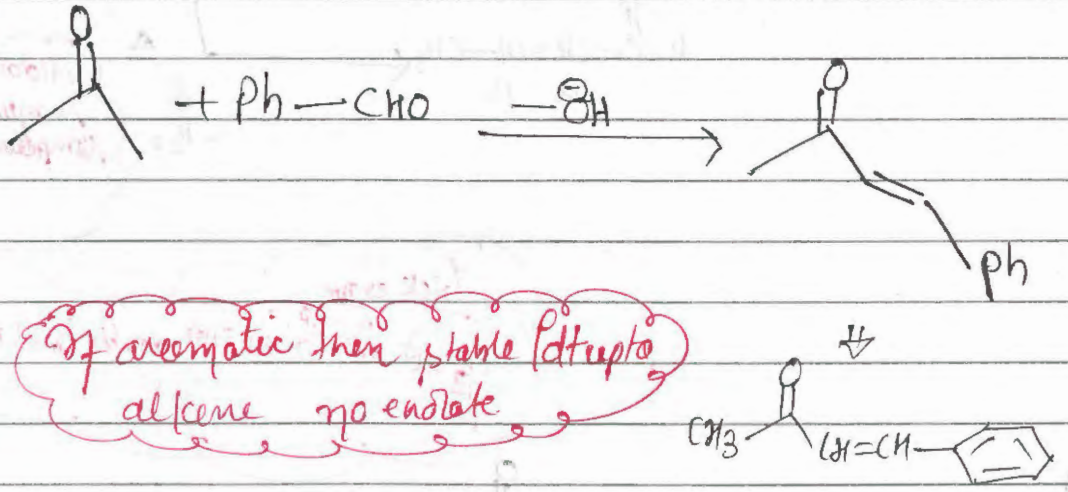
Crossed Aldol Condensation ⇒



$$CH_3-CH_2-\overset{O}{\overset{\|}{C}}-H + CH_3-\overset{O}{\overset{\|}{C}}-H \xrightarrow{NaOH/\Delta} CH_3-CH_2-CH=CH-\overset{O}{\overset{\|}{C}}-H$$

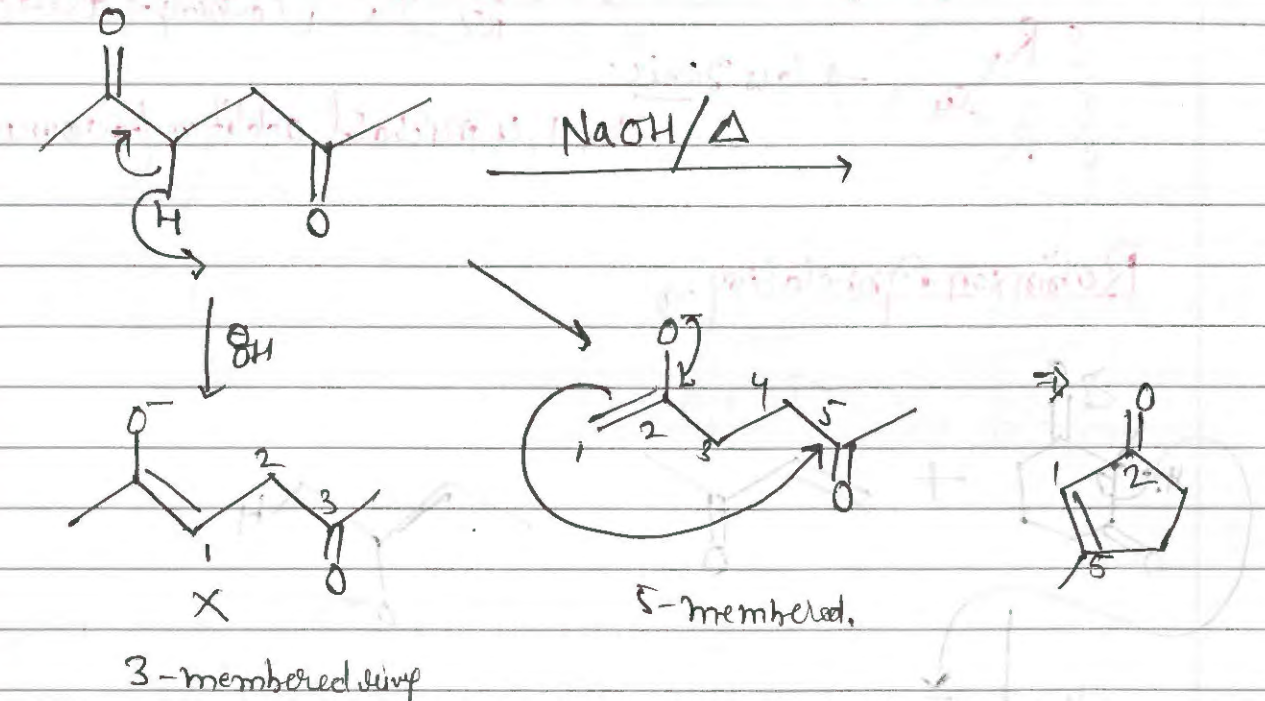
So, Total 4-Product formed (Mixture).

So, in crossed aldol condensation ⇒ Selectivity is required.

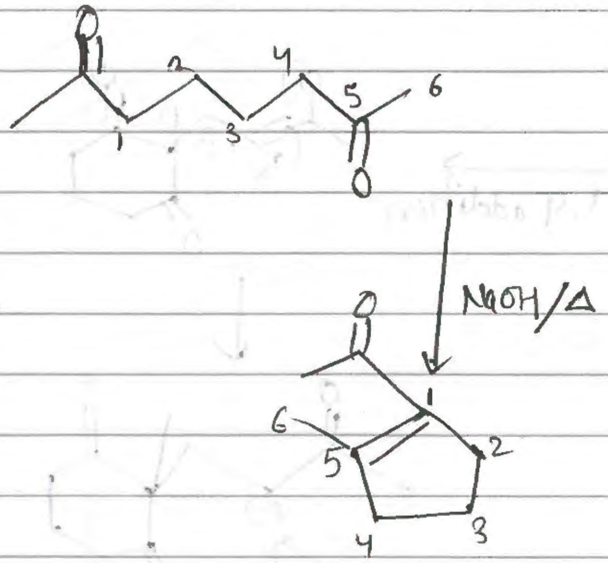


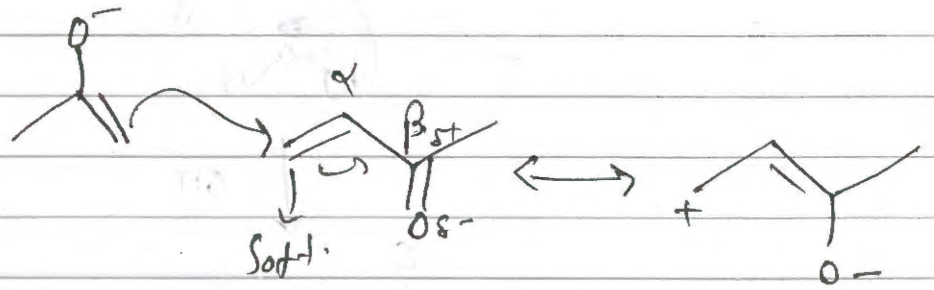
If aromatic then stable (attupto alkene no enolate

Intramolecular aldol Condensation ⟹



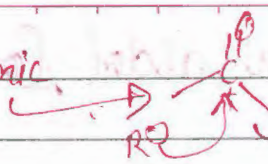
5, 6 membered are most stable.
in case of 5 & 7 membered ring
5-membered is more stable.





Imp (1,4-Michael addition)

R-Mgx → more ionic

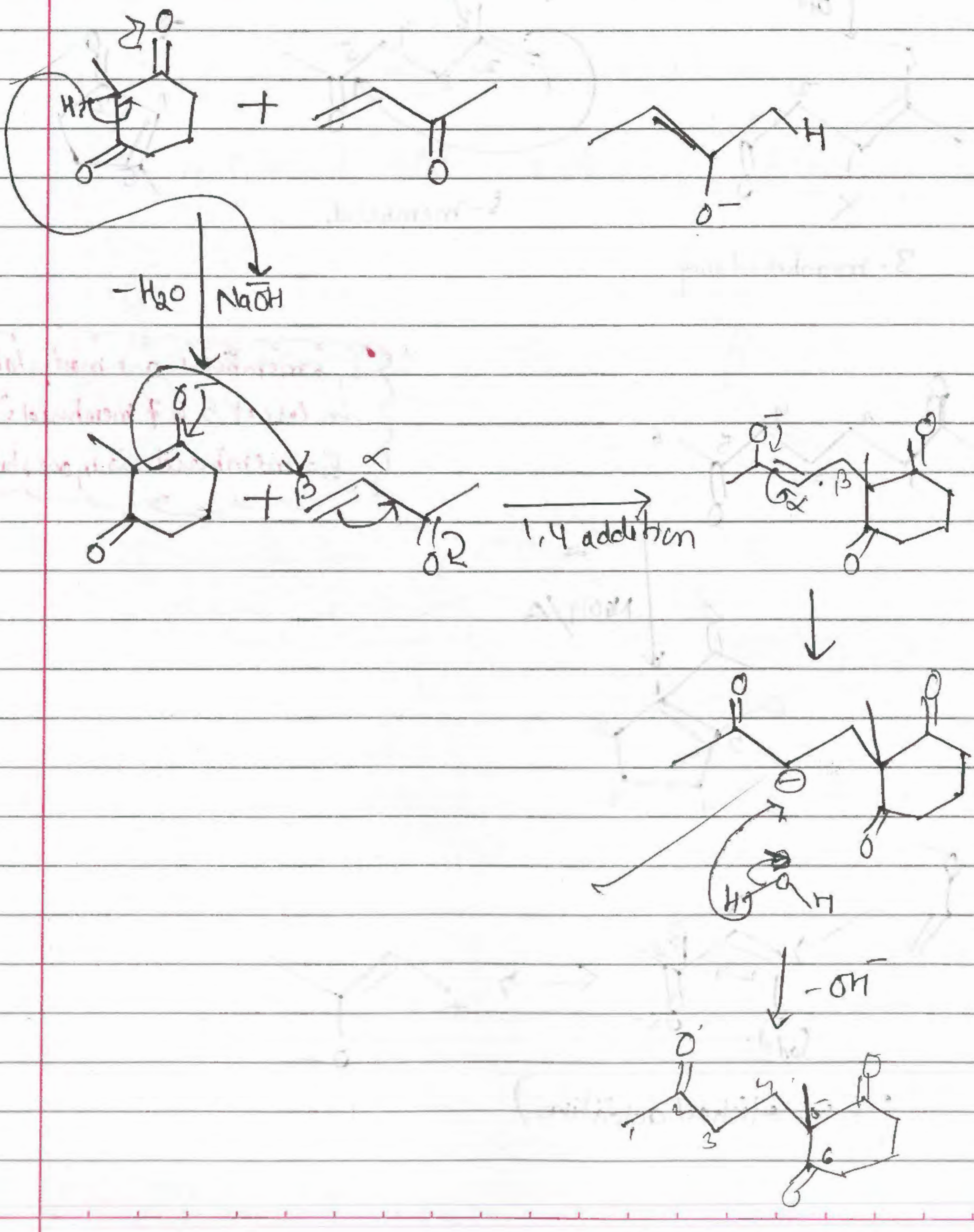


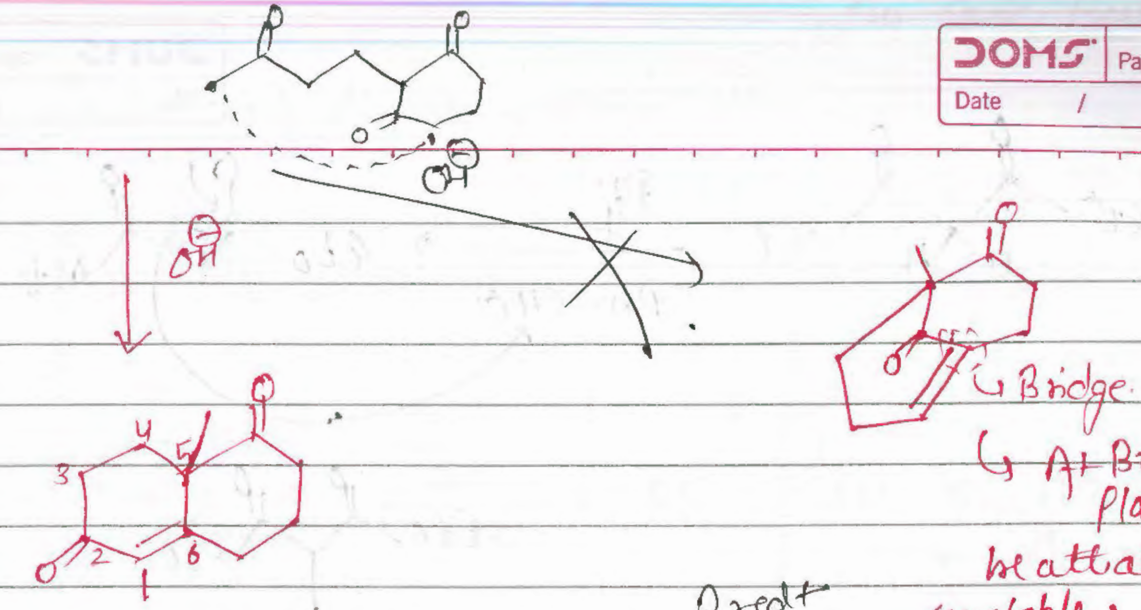
↳ Carbonyl attack.

{ R, Cu, R → less Ionic

↳ 1,4 Michael addition favoured. }

Robinson Annelation →



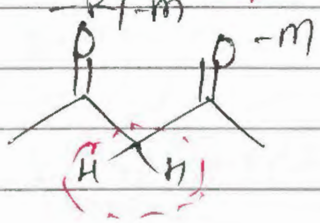


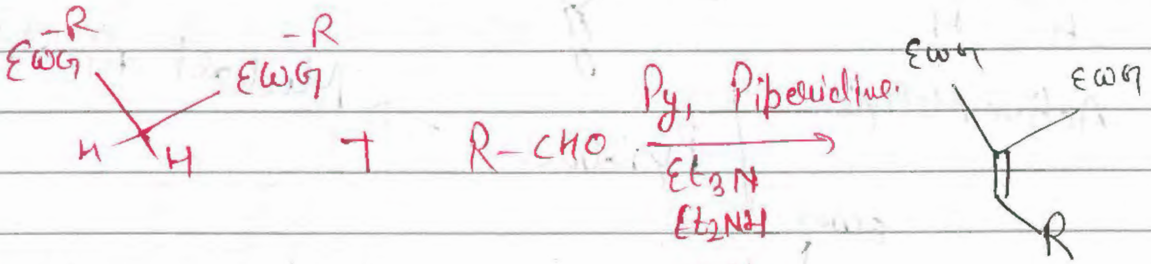
↳ At Bridge planarity can't be attained so unstable.

no pdt formed.

Bredt Rule.

Knoevenagel Rxn/Condensation ⇒



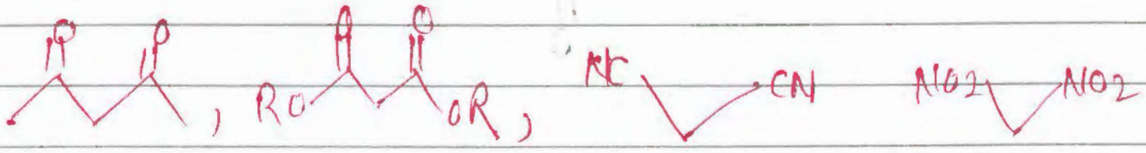


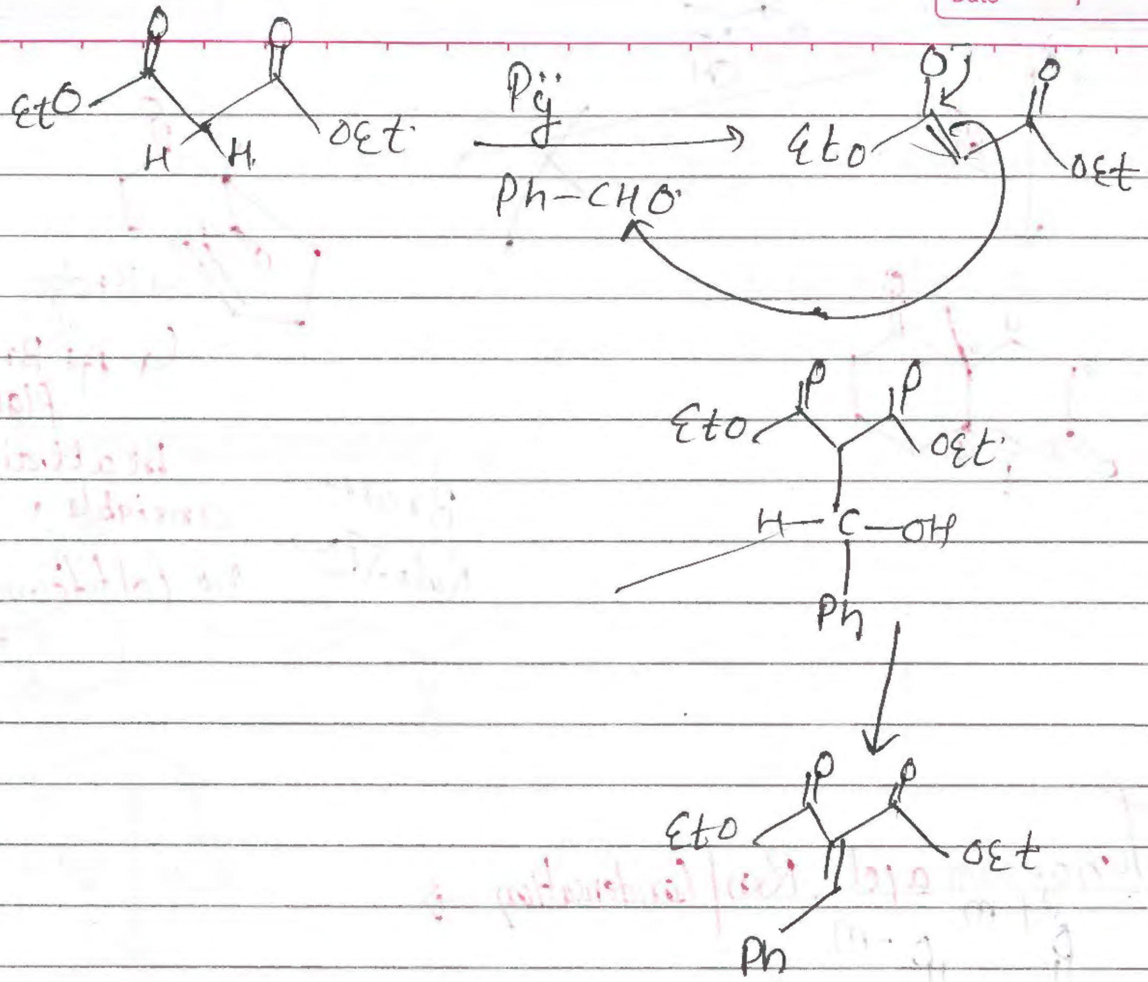
Et_3N

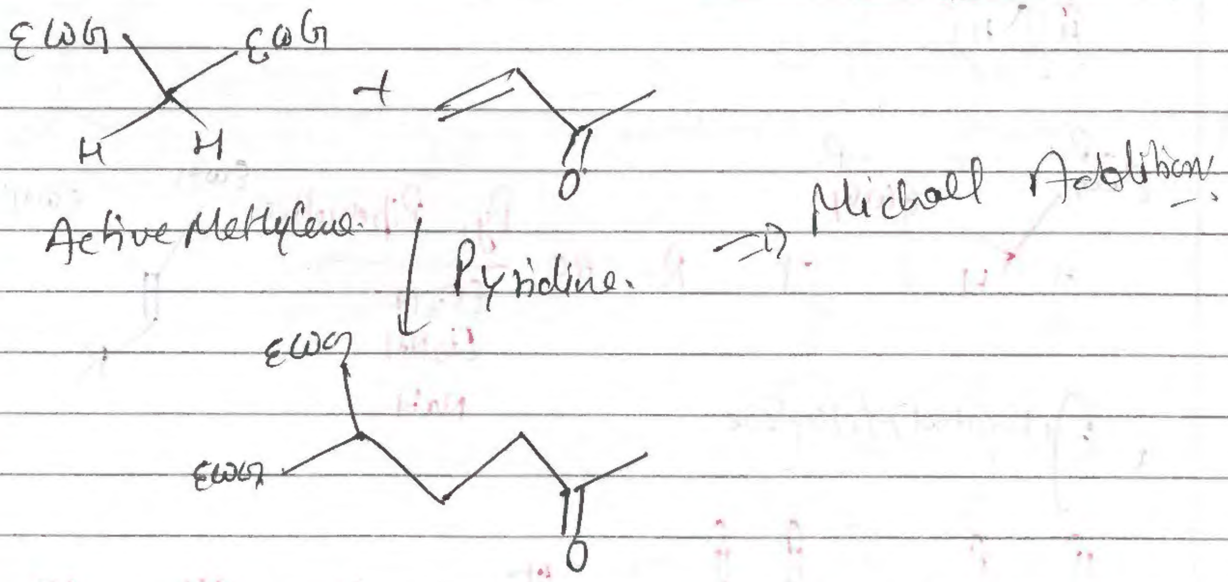
Et_2NH

NaH

Activated Methylene.




EtO
H
H
OEt
Py
Ph—CHO
EtO
OEt
EtO
OEt
H—C—OH
Ph
EtO
OEt
Ph


EWG
EWG
H
H
+
O
Active Methylene
Pyridine
=> Michall Addition
EWG
EWG
O