R.A usu. (I) $RCH=O \xrightarrow{(1^\circ \text{Alcohol})} RCH_2OH$

a) $LiAlH_4$ / ROH b) $NaBH_4$ / EtOH c) B_2H_6 / AcOH d) H_2 (Ni) e) Na + EtOH

f) MPV [$Al(OCHMe_2)_3$ + ROH]

(II) $R-\underset{\underset{O}{\|}}{C}-R \longrightarrow R_2CH-OH$ (2° Alcohol)

i) $LiAlH_4$ ii) H_2 (Ni) iii) B_2H_6.

(III) $RCO_2H \longrightarrow RCH_2OH$.

a) $LiAlH_4$, b) B_2H_6 + AcOH c) Na + EtOH.

(IV) $R-\underset{\underset{O}{\|}}{C}-Cl \longrightarrow RCH_2OH$

i) LAH ii) $NaBH_4$ iii) H_2 (Ni) iv) Na + EtOH.

(V) $R-\underset{\underset{O}{\|}}{C}-OR' \longrightarrow RCH_2OH + R'OH$.

i) $LiAlH_4$ ii) Na + EtOH. iii) B_2H_6 / AcOH.

(VI) $R-\underset{\underset{O}{\|}}{C}-O-\underset{\underset{O}{\|}}{C}-R' \longrightarrow RCH_2OH + R'CH_2OH$.

i) $LiAlH_4$ ii) H_2 (Ni) iii) B_2H_6.

ii) Na / EtOH

(VII) $R-\underset{\underset{O}{\|}}{C}-NH_2 \longrightarrow RCH_2NH_2$

i) LAH

ii) B_2H_6 / AcOH.

~~iii) H_2 (Ni) (raw)~~

iii) Na + EtOH

Q. Which is most reactive towards LAH (Nucleophile) or RMgX (Nucleophile)

More is the $\delta+$ charge on carbonyl carbon, faster is the reaction.

$\delta+$

✓ a) $R-\underset{\underset{O}{\|}}{C}-Cl$

b) $R-\underset{\underset{O}{\|}}{C}-OR$

c) $R-\underset{\underset{O}{\|}}{C}-NMe_2$

d) $R-\underset{\underset{O}{\|}}{C}-O-\underset{\underset{O}{\|}}{C}-R$

Q (VIII) $R-C\equiv N \longrightarrow RCH_2-NH_2$

✓ a) LAH b) H_2(Ni) c) B_2H_6/AcOH d) Na + EtOH.

Q. (IX) $R-\overset{+}{N}\equiv C \longrightarrow RNH-CH_3$

a) LAH b) H_2(Ni)

(X) $R-\underset{\underset{O}{\|}}{C}-NHMe \longrightarrow R-CH_2-NHMe$.

2° Amine

X) $R-C\equiv N \longrightarrow RCH=O$.

a) $SnCl_2$ + HCl(aq) b) DIBAL-H (−78°C)

Stephen.

(XI) $R-\underset{\underset{O}{\|}}{C}-Cl \longrightarrow RCH=O$ Rosenmund

✓ i) DIBALH (−78°C)

or

✗ ii) LiAlH(OtBu)$_3$ (−78°C)

✓ iii) H_2(Pd/Baso$_4$)/Lindlar.

(XII) $R-\underset{\underset{O}{\|}}{C}-OR$ / $R-\underset{\underset{O}{\|}}{C}-O-\underset{\underset{O}{\|}}{C}-R$ / $R-\underset{\underset{O}{\|}}{C}-NH_2$ / $R-\underset{\underset{O}{\|}}{C}-NR_2$ ⟶ $RCH=O$.

I can use DIBALH (−78 °C)

(XIII) R-X $CH_3CH_2-X \longrightarrow CH_3-CH_3$

i) αAH ii) TPH. iii) Zn + CH_3CO_2H
iv) red P + HI v) Mg + H_2O

(XIV) 2° R-X $CH_3\underset{\underset{X}{|}}{CH}-CH_3 \longrightarrow CH_3CH_2CH_3$

i) αAH ii) TPH iii) SBH. iv) Mg + H_2O.
v) Red P + HI. vi) Zn + CH_3CO_2H.

(XV) 3° R-X $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-X \longrightarrow CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_3$

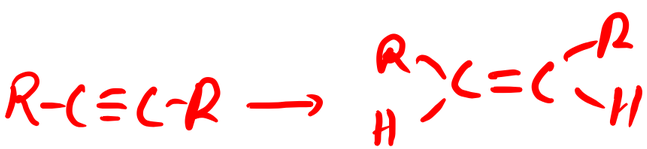
i) $NaBH_4$ ii) TPH. iii) Zn + CH_3CO_2H
iv) Red P + HI. v) Mg + H_2O.

(XVI) $H_3C-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-X \longrightarrow H_2C=C(CH_3)-CH_3$

i) αAH ii) alcoholic KOH iii) OR / Δ.

(XVII) $RCH=NH \longrightarrow RCH_2-NH_2$

i) αAH ii) SBH iii) H_2(Ni) ✓ (c) B_2H_6 / CH_3CO_2H

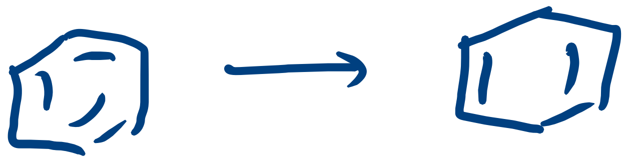
(XVIII) $R-C\equiv C-R \longrightarrow$ 

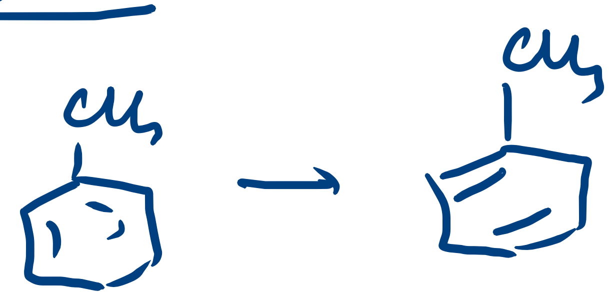
✓ a) H_2 (Lindlar) or ✓ (b) H_2 (Ni_2B) P-2 Catalyst
d) $N_2H_4 + H_2O_2$

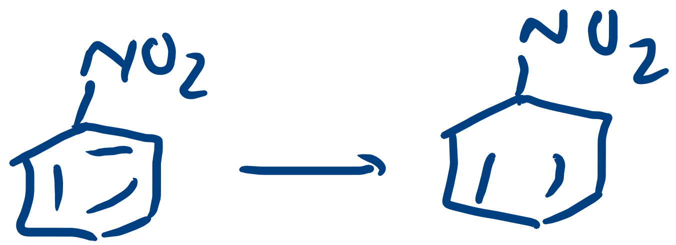
(21) $RC\equiv CR \longrightarrow RCH_2CH_2R$ only $H_2(Ni)$ (xs)

(22)

a) $R-C\equiv C-R \longrightarrow$ *trans*-$RCH=CHR$ (R / H on opposite sides of C=C)

b) 

c) 

d) 

} for BR (Birch reduction): Na in liq. NH_3 or Li in liq. NH_3.

(23)

a) $RCH=CH-R \longrightarrow RCH_2CH_2R$.

b) $RN=N-R \longrightarrow RNH-NHR$

c) $RC\equiv CR \longrightarrow$ *cis*-$RCH=CHR$ (R, R on same side; H, H on same side)

} $\dfrac{N_2H_4 + H_2O_2}{H-N=N-H}$. (diimide)

(25) RCO_2H / RCH_2OH / $R-CH=O$ / RCH_2-X $\longrightarrow R-CH_3$

$\dfrac{\text{red } P + HI}{\text{or } HI/\Delta}$.

(24) a) $RCH=O \longrightarrow RCH_3$ (b) $R-\underset{O}{\overset{\|}{C}}-R \longrightarrow RCH_3$.

i) Zn(Hg) + conc. HCl

ii) $N_2H_4 + \bar{O}H/\bar{O}R$ glycol + Δ.

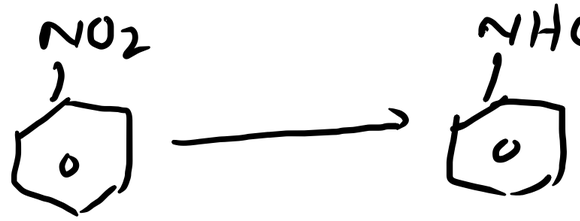
iii) red P + HI

iv) CH_2SH–CH_2SH, Raney Ni $(+H_2)$.

(26) 

Reducing nitrobenzene gives aniline.

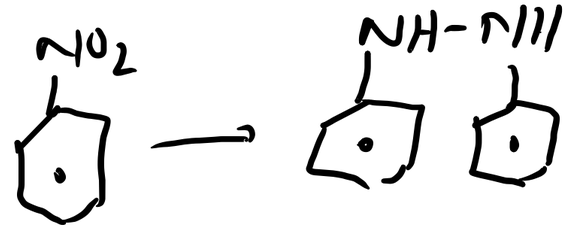
The reducing agents can be used is
a) Sn + HCl b) Zn + HCl c) Na(Hg) + conc. H_2SO_4
d) Fe + HCl
in acidic medium.
[4 metals can be used Sn ; Zn ; Fe ; Na]

(27) 

(+ve Tollens test)
(Phenyl hydroxyl amene)

Reducing nitrobenzene

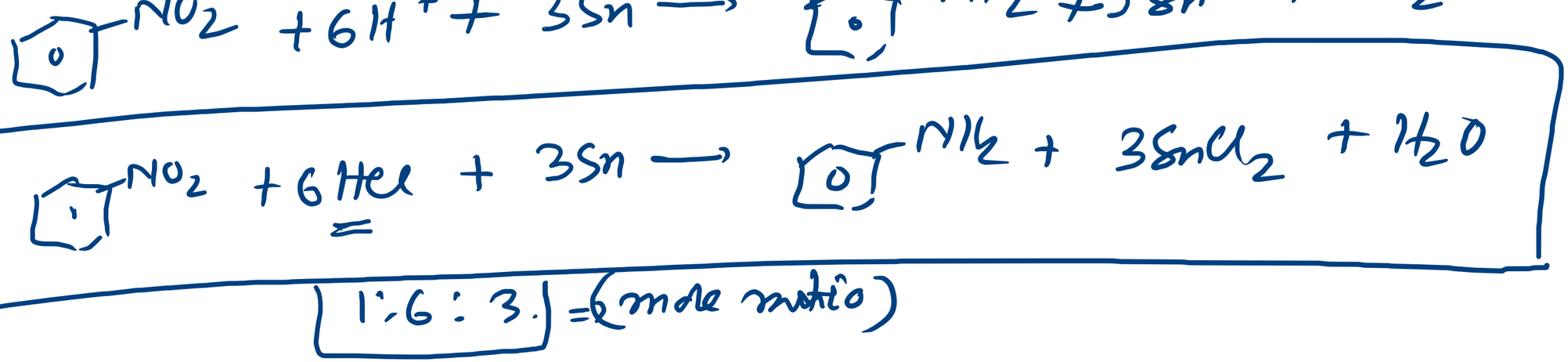
The reducing agents used can be
Zn + NH_4Cl (Mulliken Barker Test)
in neutral medium to give PhNHOH

(28) 

Reducing nitrobenzene in basic medium

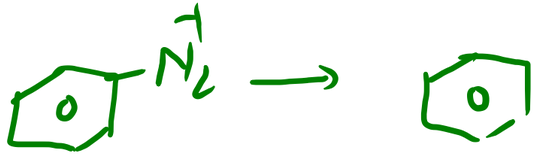
The reducing agents used can be.
Zn + NaOH (xs) ⟶ PhNH-NH-Ph
low amount → PhN=N-Ph.
Azobenzene.

$$+6e^- \qquad 3\times(Sn + \cdots \longrightarrow Sn^{2+} + 2e^-)$$



$$1 : 6 : 3 \text{ (mole ratio)}$$

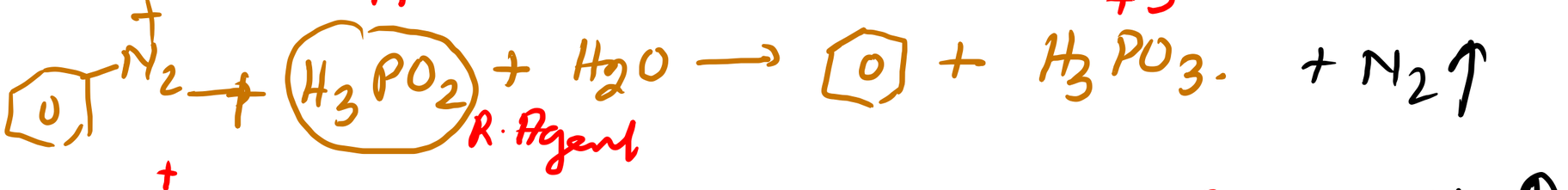
Benzene diazonium ion

(29) a)  : Reduct: (loss of N_2)

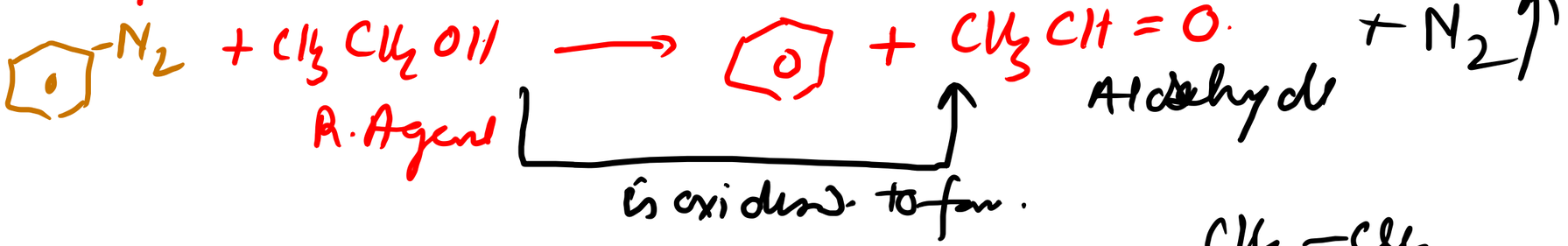
Reducing agents.

a) H_3PO_2 (Hypophosphorus acid) or (Phosphinic acid)

b) EtOH.



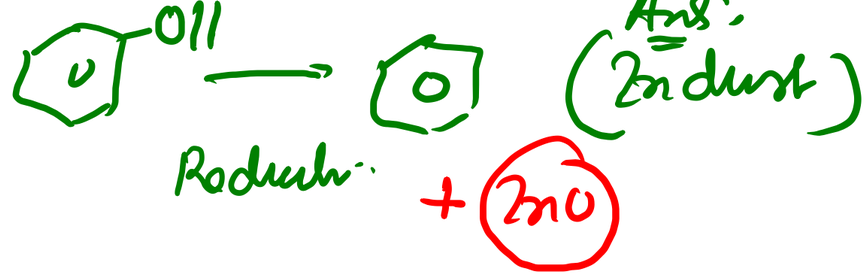
Adding H_2 : Reduct.

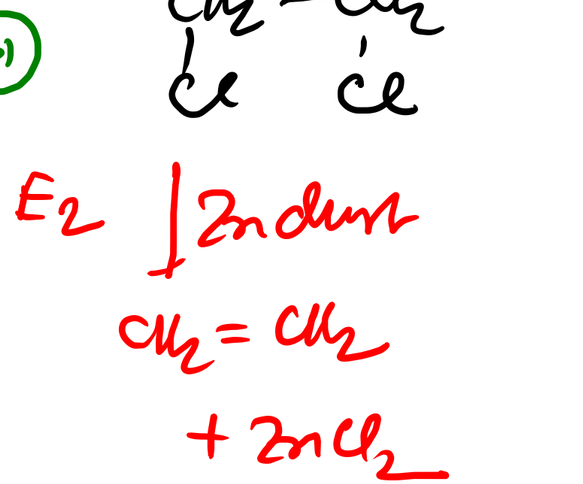


Loss of oxygen : Reduct.

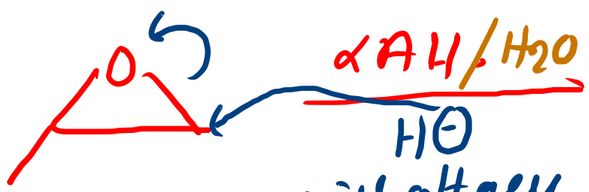
Adding $\bar{e}$: Reduct.

Loss of halogens : Reduct.

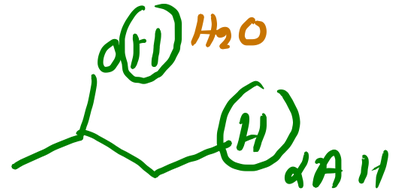
(30) 

(31) 

(32)

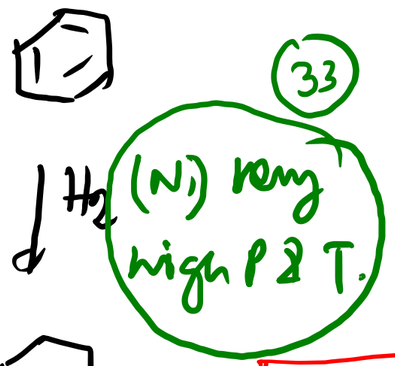


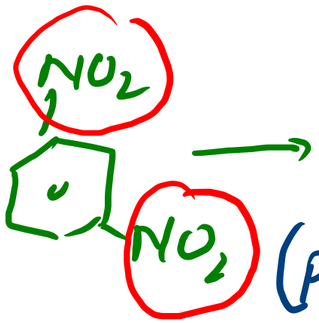
(Substrate) (Oxirane)



less sterically crowded carbon.

$\xrightarrow[(Ni)]{H_2}$ no reaction.





(Partial reduction)

i) NH_4HS / $NH_3 + H_2S$ → given in IIT-JEE advance

ii) NaHS / Na_2S / $(NH_4)_2S$

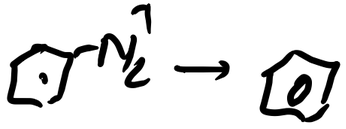
i) $(NH_4)_2S$ / $NH_3 + H_2S$ / Na_2S / NaHS

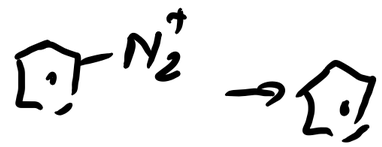
ii) $Zn + NH_4Cl$

iii) $Zn + NaOH$

iv) Sn + HCl ; Fe + HCl ; Zn + HCl ; $Na(Hg) + H_2SO_4$.

v) Zn dust. 

vi) H_3PO_2. 

vii) EtOH 

viii) H_2 (Ni) at very high P & Temp

Heating Effect :

$-CO_2\uparrow$ (common) : Decarboxylation.

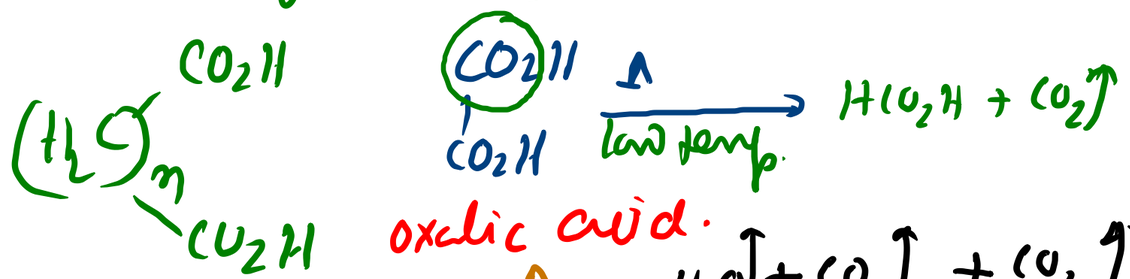
$-CO\uparrow$ (rare) : Decarbonylation.

$-H_2O\uparrow$ (common) : Dehydration.

$-NH_3\uparrow$ (rare) : Deamination.

Heating effect of OMSCHAPSN

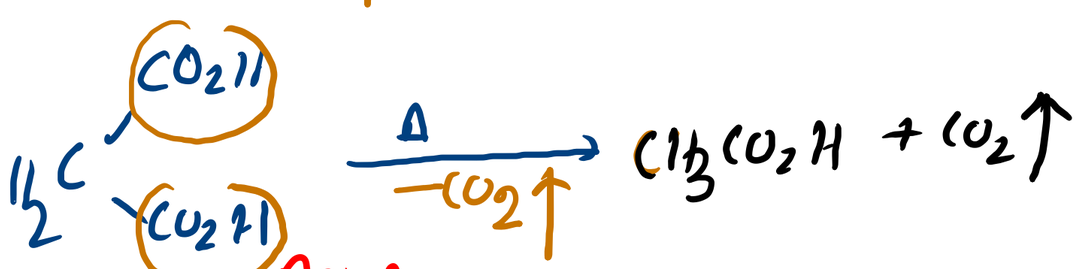
⟶ (Dicarboxylic acid)



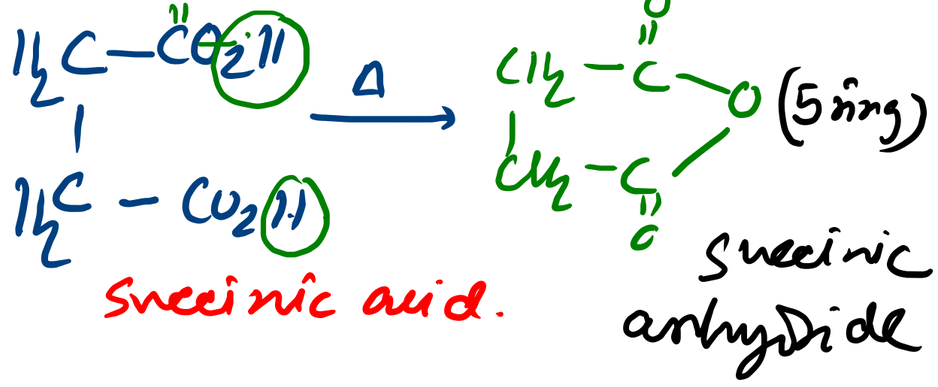
Oxalic acid. $\xrightarrow[\text{high temp}]{\Delta}$ $H_2O\uparrow + CO\uparrow + CO_2\uparrow$

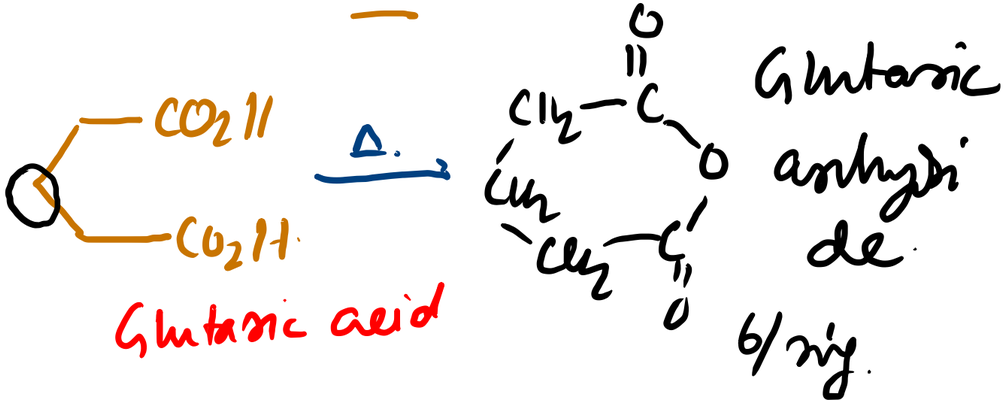
Thermally unstable.

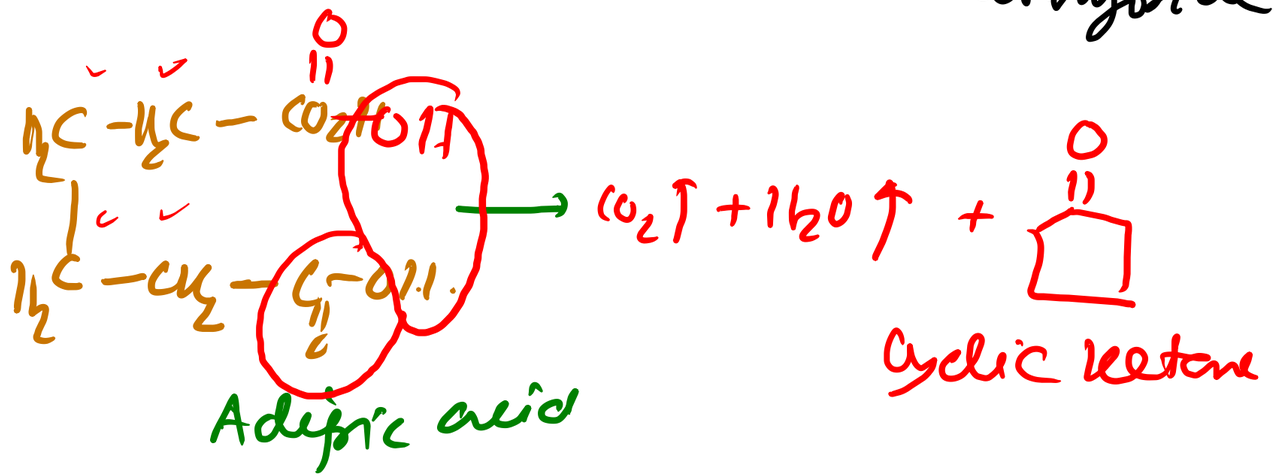
(gem dicarboxylic acid)



Heating give cyclic pdt 5/6 membered rg. is formed.

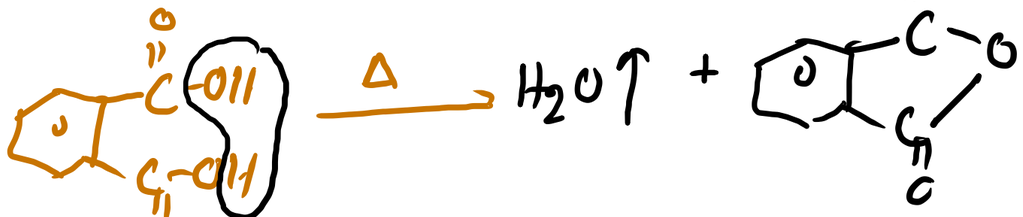






Pimelic Acid

a)

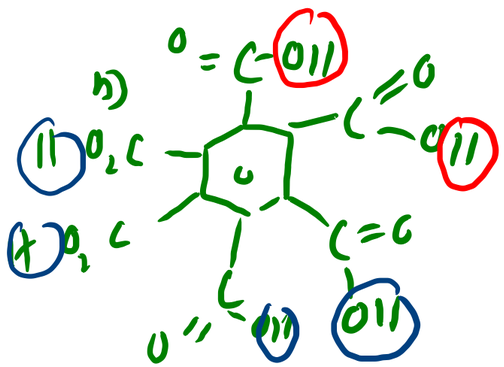


Phthalic Acid.

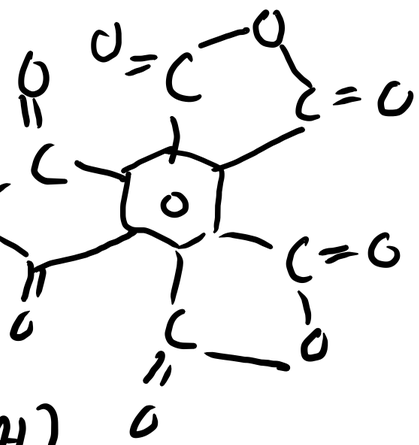
-CO↑.

CO2↑

Suboxide { C_3O_2 / $C_{12}O_9$



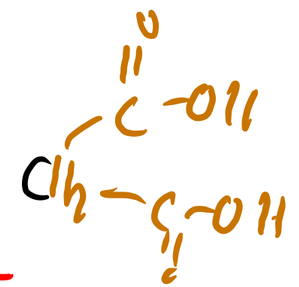
Mellitic Acid $C_6(CO_2H)_6$

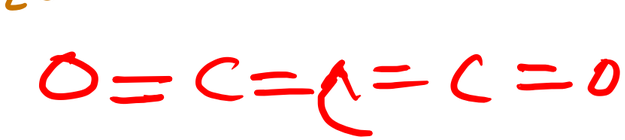


Aromatic / 3 unit $-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-$ present.

(Trianhydride) / $C_{12}O_9$

Carbon suboxide.





Carbon Suboxide