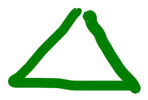
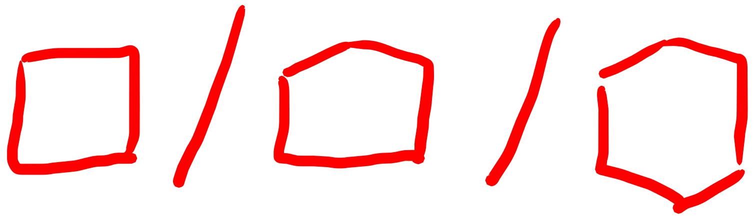
Intra molecular Wurtz (very fast)

a) 

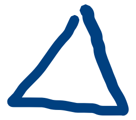
(Dihalide)

b) $Cl-\overset{1}{CH_2}-\overset{2}{CH_2}-CH_2-Cl \xrightarrow[D.E]{Na}$ 

3/4/5/6 mbg 3 is formed.

c) $Cl-(CH_2)_{3/4/5/6}-Cl \xrightarrow[D.E]{Na}$ 

d) $\dot{C}H_2(Cl)-\dot{C}H_2(Cl) \xrightarrow[D.E]{Na} CH_2=CH_2$.

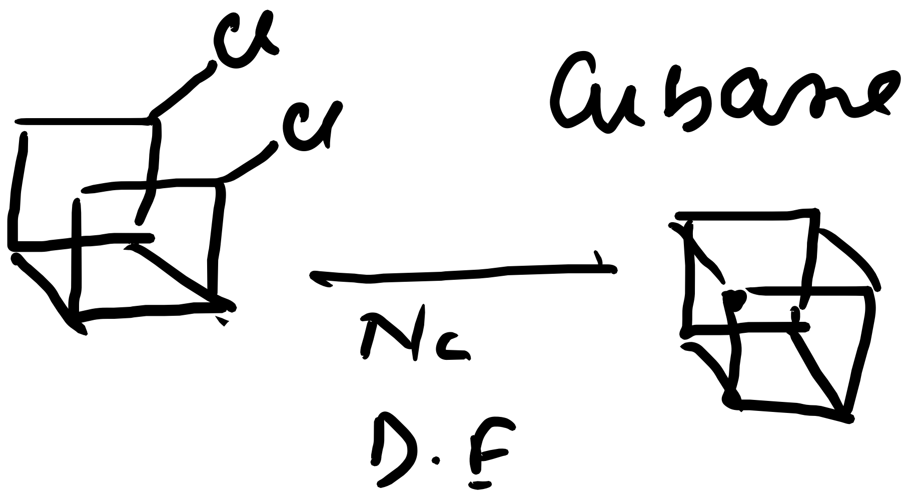
e) $CH_2(Cl)-CH_2-CH_2(Cl) \xrightarrow[dust]{Zn}$ 

Frankland Reaction.

f) $CH_2(Cl)-CH_2(Cl)$

$\xrightarrow[(1 eq)]{Mg} \overset{+}{C}H_2-\overset{(-)}{C}H_2(MgCl)$, Cl → $CH_2=CH_2$

$\xrightarrow[excess]{Mg} CH_2(MgCl)-CH_2(MgCl)$.

g) 

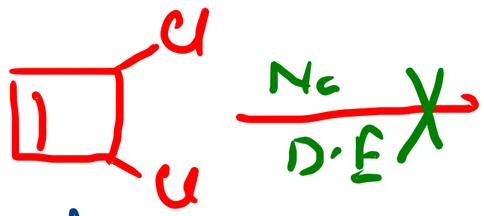
Cubane.

h) $Cl-(CH_2)_{10}-Cl \xrightarrow{\text{Intra}}$ $Cl-(CH_2)_9-CH_2 + CH_2-(CH_2)_9-Cl$.

more end on Wurtz.

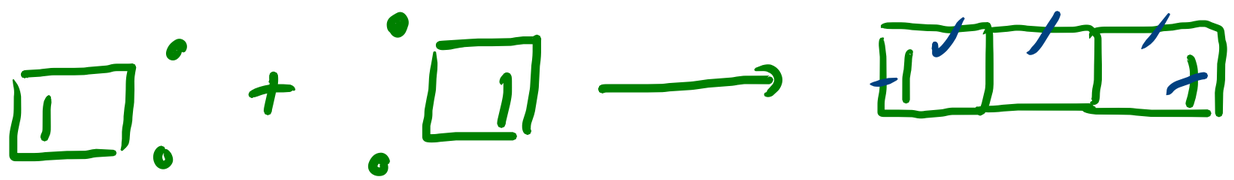
9/8/7/11 .....

$-(CH_2)_n-$ Polyalkane

i) 

 antiaromatic pdt (extremely unstable)

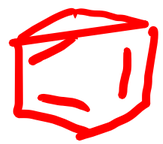
Intra Wurtz takes place



DOU = 5

(Non aromatic)

j) 

Na / D.E →  dimerise 

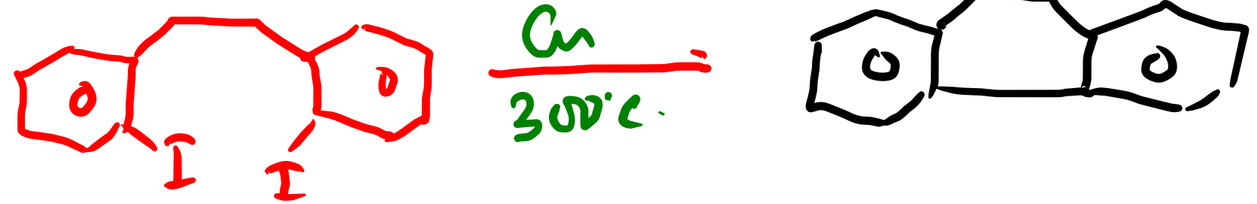
Intermediate.

k) 

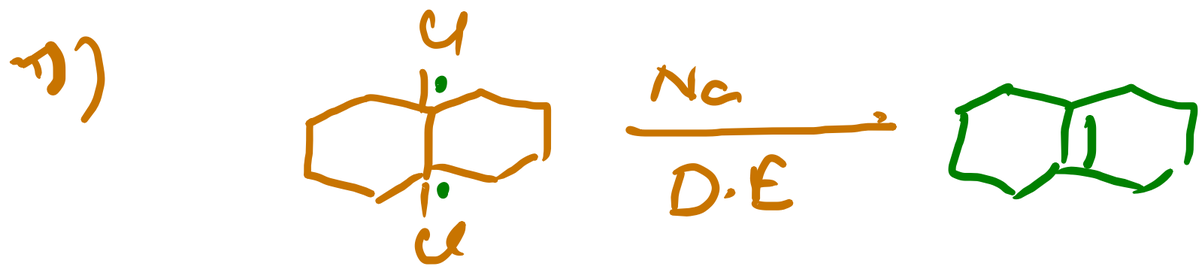
High temp; free radical
Ullman reach.

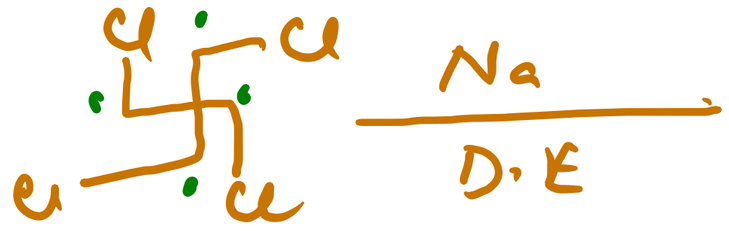
l) 

Intra Ullman.

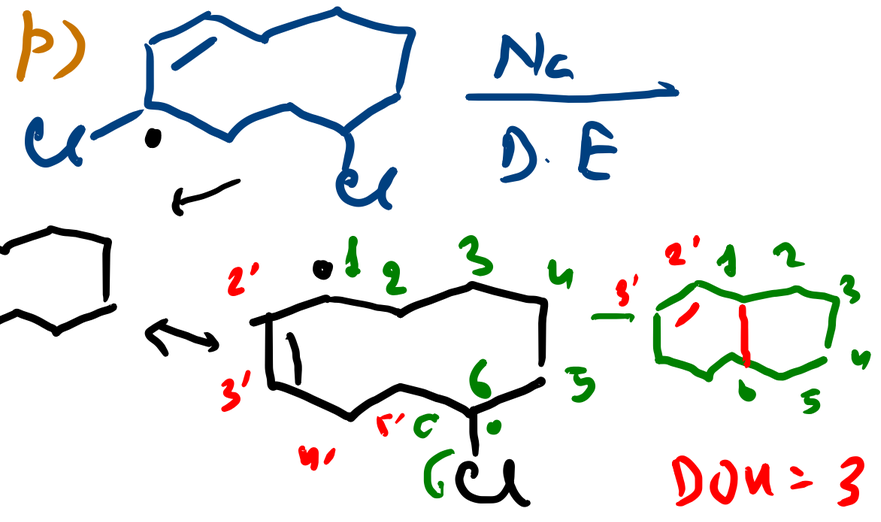
m) 

Intra Ullman

n) 

o) (Tetrahedrile) 

spiro product.

p) 

DOH = 3

i) (xs) $CH_4 \rightarrow CH_3-CH_3 \xrightarrow[h\nu]{Cl_2} CH_3-CH_2-Cl \xrightarrow[(D.E)]{Na} CH_3CH_2-CH_2-CH_3$ (symmetrical alkane)

$CH_4 \xrightarrow{Cl_2/h\nu} CH_3-Cl \xrightarrow[(D.E)]{Na} CH_3-CH_3$ (symmetrical alkane)

ii) $CH_3-CH_3 \rightarrow CH_2=CH_2 \rightarrow HC\equiv CH$

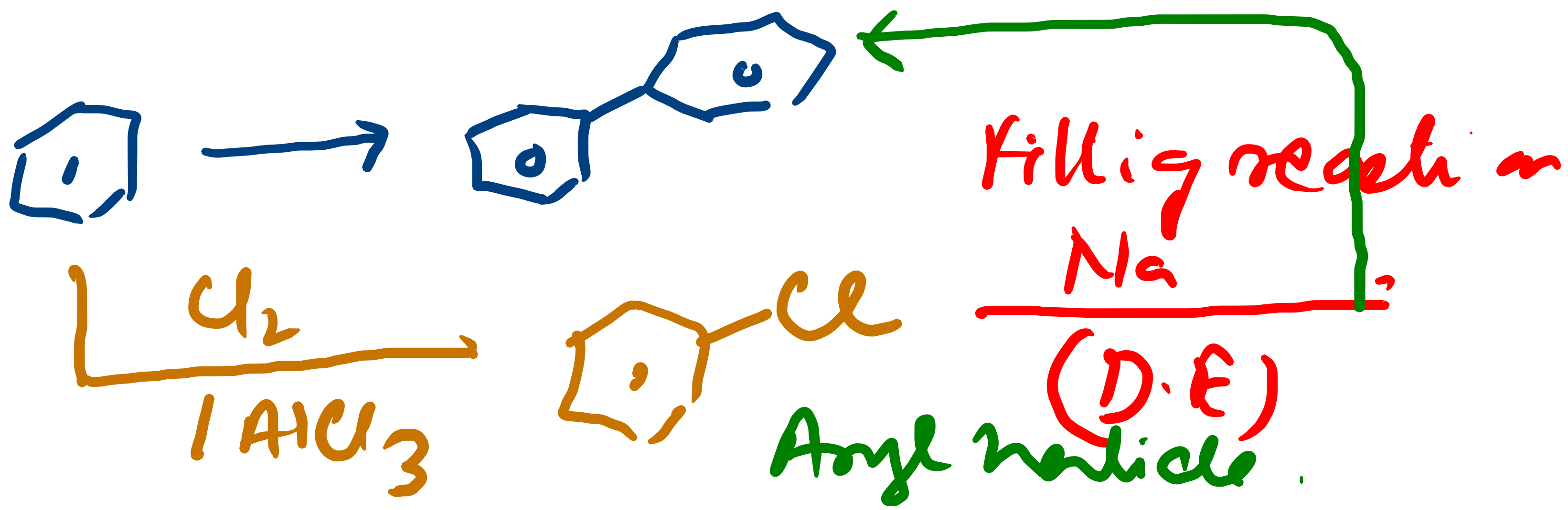
$CH_3-CH_3 \xrightarrow{Cl_2/h\nu} CH_3-CH_2-Cl \xrightarrow{\text{alcoholic KOH}} CH_2=CH_2$

alcoholic KOH ✓ (dehydrohalogenation) −(1 eq. HBr)

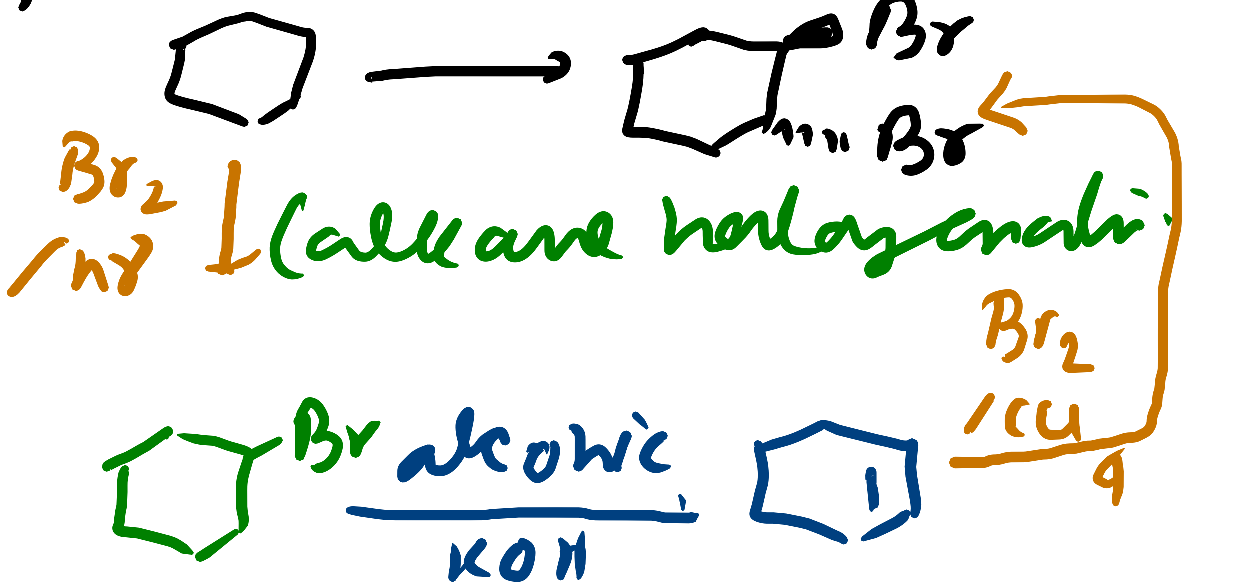
$CH_2=CH_2 \xrightarrow{Br_2/CCl_4} \underset{Br}{CH_2}-\underset{Br}{CH_2}$ vicinal dibromide.

$\underset{Br}{CH_2}-\underset{Br}{CH_2} \xrightarrow{\text{alcoholic KOH followed by } NaNH_2} HC\equiv CH$

iii)



iv)



Kolbe Electrolysis:

$$RCO_2H \xrightarrow{NaOH} R-\underset{O}{\underset{\|}{C}}-O^-Na^+ + H_2O$$

Monocarboxylic acid — Sodium salt of monocarboxylic acid. (minimum 2-carbon)

$$R-\underset{O}{\underset{\|}{C}}-O\,Na^+ \text{ (aq. solution)} \xrightarrow[\text{using proper electrode}]{\text{Electrolysis}} \boxed{R-R} \text{ (anode)} + CO_2 \text{ (gas anode)} + H_2\uparrow \text{ (cathode)}$$

Solution: NaOH (basic)

=> CH_4 can't be prepared.

=> symmetrical alkane > Nonsymmetrical alkane. pH of solution gradually increases ↑.

=> even no. of carbon atoms > odd no. of carbon atoms.

Mechanism:

$R-\underset{O}{\underset{\|}{C}}-O^-Na^+ \xrightarrow{E.L} Na^+ + R-\underset{O}{\underset{\|}{C}}-O^-$

$Na \rightarrow Na^+ + \bar{e}$

$Na^+ + \bar{e} \not\rightarrow Na$

$H_2O \xrightarrow{E.L} H^+ + \boxed{\bar{O}H}$

$H^+ + \bar{e} \longrightarrow \frac{1}{2} H_2\uparrow$ (Cathode, Reduction)

$R-\underset{O}{\underset{\|}{C}}-O - \bar{e} \longrightarrow R-\underset{O}{\underset{\|}{C}}-\dot{O} \longrightarrow R^\cdot + CO_2\uparrow$ (anode, oxidation)

$R^\cdot + R^\cdot \longrightarrow R-R$

CH_2-CO_2Na
|
CH_2-CO_2Na

sodium succinate.

$\uparrow NaOH$

CH_2-CO_2H
|
CH_2-CO_2H

Succinic Acid.

Alkane: CO_2 (anode) $\uparrow$.

$H_2\uparrow$. (Cathode)

solution: NaOH (basic)

during progress of reaction more & more NaOH is formed.

$\uparrow$ PH of solution $\uparrow$.

CH_2-CO_2Na
|
CH_2-CO_2Na

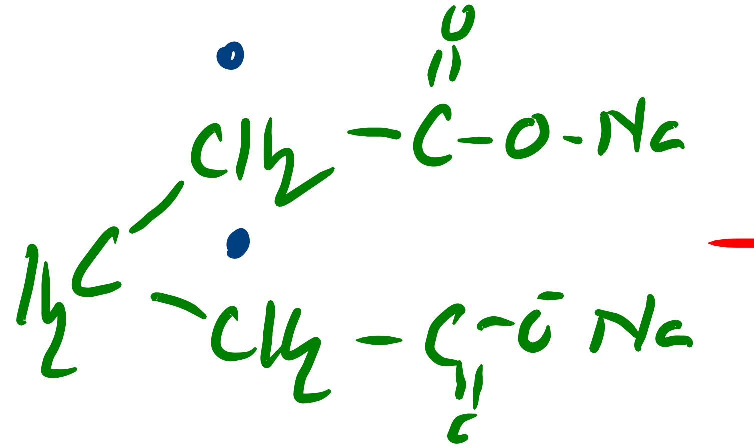
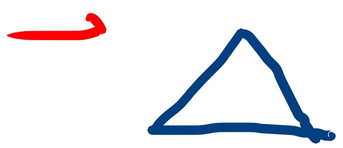
Sodium succinate.

$\xrightarrow{E.L} CH_2=CH_2\uparrow + CO_2\uparrow$

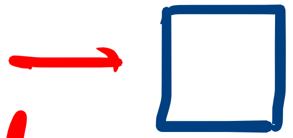
+ NaOH

Intra Kolbe reaction is very fast.

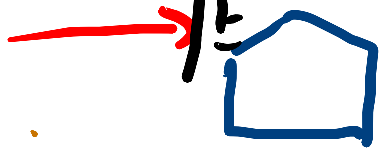
IIT

a)  → 

Glutaric Acid

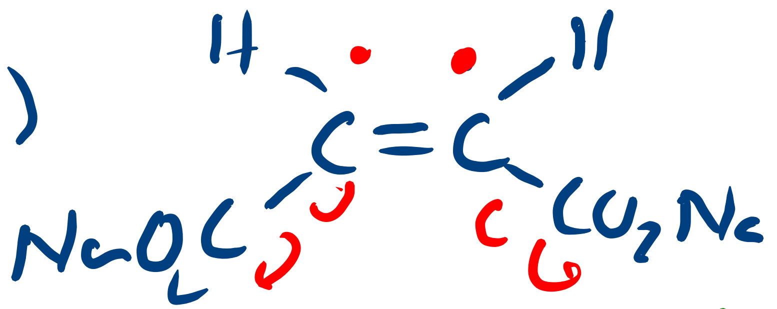
b) $NaO_2C-(CH_2)_4-CO_2Na$ 

Adipic Acid

c) $NaO_2C-(CH_2)_5-CO_2Na$ 

Pimelic Acid

C
Y
C
L
U
A
L
K
A
N
E

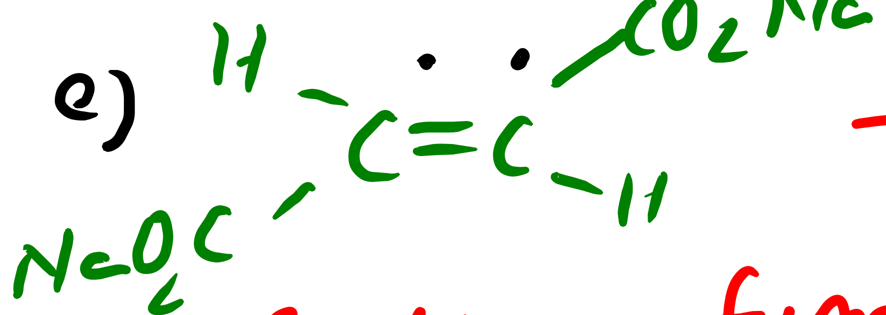
d) 

Sodium maleate.

→ $HC \equiv C-H$

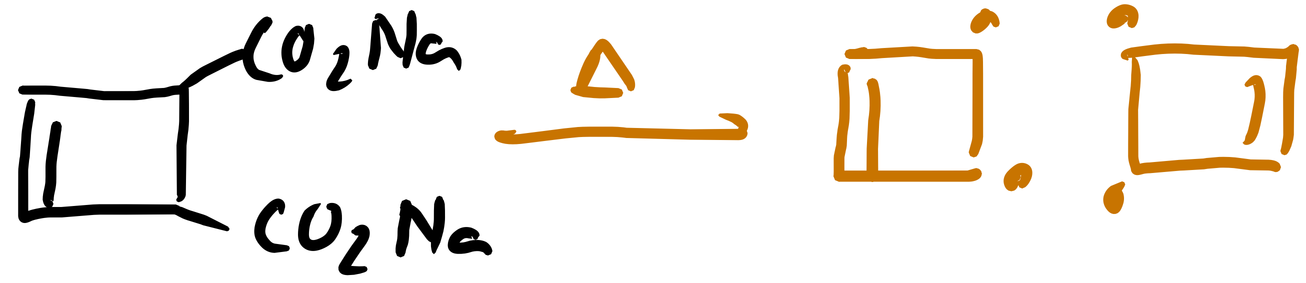
Acetylene.

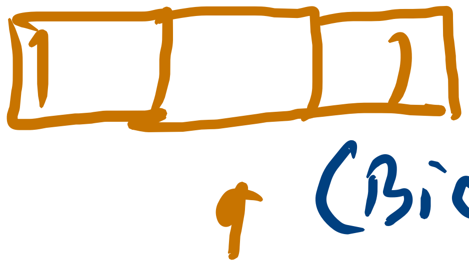
carbene form.

e) 

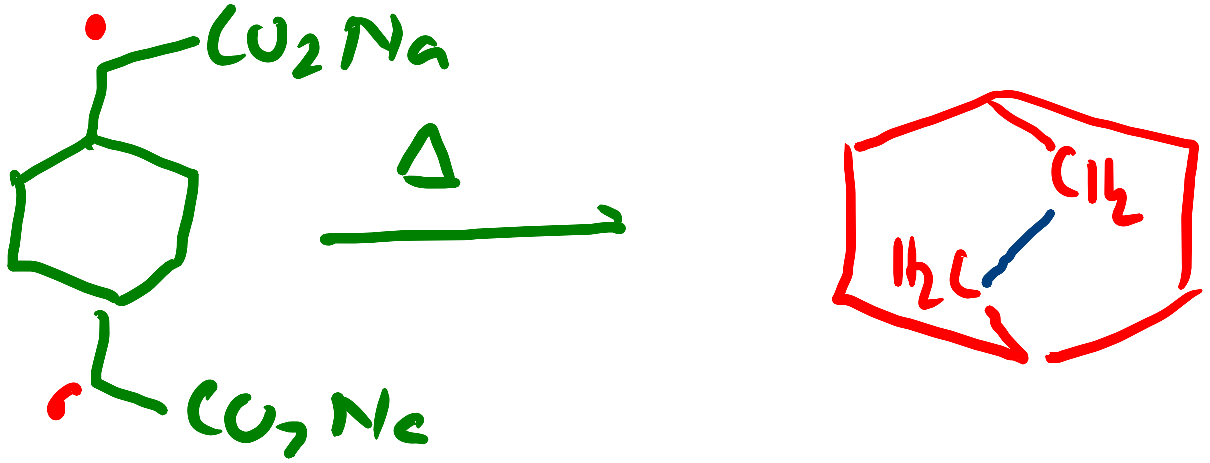
Sodium fumerate.

→ $HC \equiv C-H$.

f) 



(Bicyclo pdt)

g) 

(Bicyclo pdt)

Na-butanoate $\xrightarrow{\text{E.L.}}$ Anode

Alkane (A)

$\uparrow$ Na(D.E)

B (alkyl halide)

Q1. $CH_3CH_2CH_2CO_2H \xrightarrow{NaOH}$ $CH_3CH_2CH_2-\underset{\underset{O}{\|}}{C}-ONa$.

$\downarrow$ E.L.

$CH_3-CH_2-CH_2-CH_2-CH_2-CH_3$ (n-hexane) (A).

$\uparrow$ Na/D.E

Q2 X (vapour density 36)

$\downarrow Cl_2/hv$.

only 1 pdt (Y)

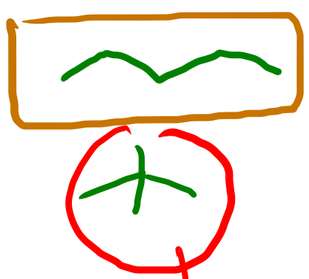
$\downarrow$ Na/D.E

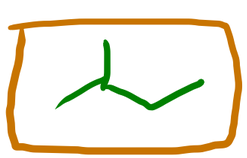
Z.

$M.Wt = 2 \times V.D = 72$ (C_5H_{12}) ✓

$n$pr-Cl $CH_3CH_2-CH_2-Cl$

(1-chloropropane)





$H_3C-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_3 \xrightarrow[(hv)]{Cl_2}$ $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_2Cl \xrightarrow{Cl_2/hv \cdot Na/D.E}$ $Me_3C-CH_2-CH_2-CMe_3$

(Wurtz Reaction)

Q. X $\xrightarrow[\text{Soda lime.}]{NaOH + CaO/\Delta}$ 

72

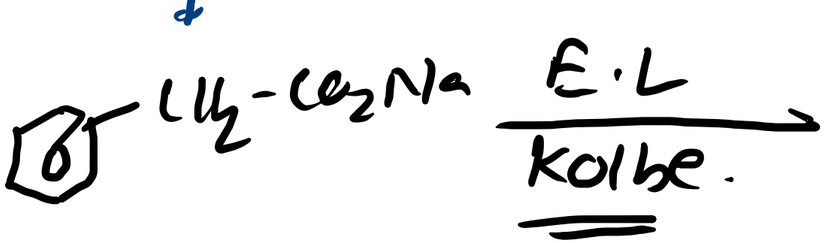
m.f = C_5H_{12}

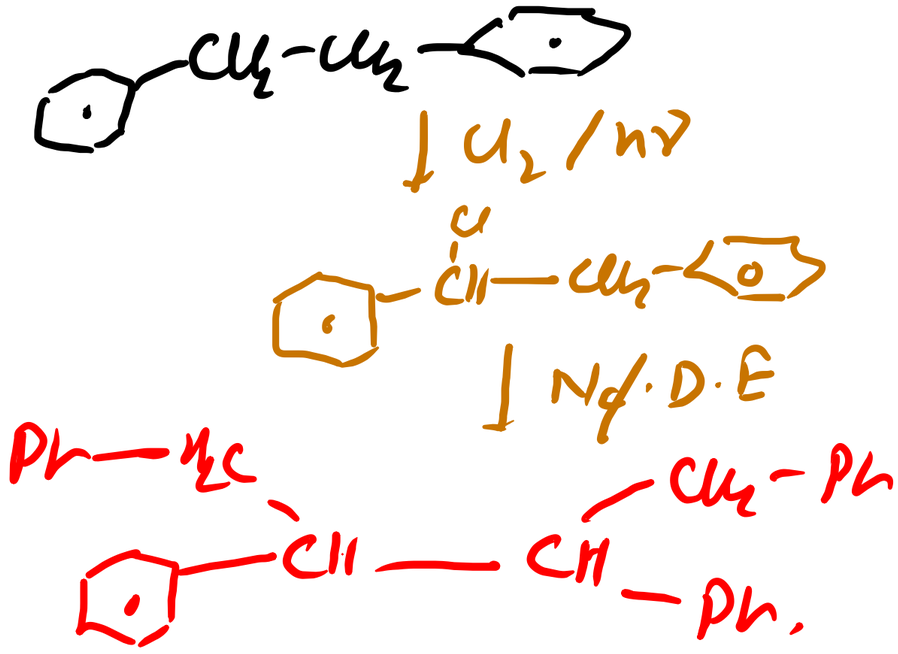
$Cl_2/h\nu$

NaOH ↓

Y $\xrightarrow{E.L}$ Z (alk hydrocarbon) [symmetrical alkene]

Z → $Cl_2/h\nu$ → W ↓ Na/D.E → V.





Q. 1-chloropropane $\xrightarrow{KCN}$ X $\xrightarrow[\text{dilute acid.}]{H_3O^+}$ Y $\xrightarrow{NaOH}$ Z $\xrightarrow{E.L}$ W

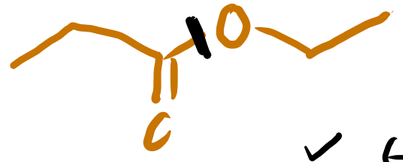
$CH_3CH_2CH_2-Cl \xrightarrow{KCN} CH_3CH_2CH_2-CN \xrightarrow{H_3O^+} CH_3CH_2CH_2-CO_2H$

$CH_3CH_2CH_2-CO_2H \xrightarrow{NaOH} CH_3CH_2CH_2-C(=O)-ONa$

$CH_3CH_2CH_2-C(=O)-ONa \xrightarrow{E.L} (n\text{-hexane})$

$PCl_5 / PCl_3 / SOCl_2$ ($ROH \rightarrow R-Cl$)

Q. (4 atm)



$\xrightarrow{H_3O^+}$ X + Y.

X => $CH_3CH_2-CO_2H$ Y => CH_3-CH_2OH

Z_1 => $CH_3CH_2CO_2Na$ Z_4 => $CH_3CH_2-CH_2CH_3$

(Acid) (X) $\xrightarrow{NaOH}$ Z_1 $\xrightarrow{E.L}$ Z_2 (hydrocarbon)

(Alcohol) Y $\xrightarrow{PCl_5}$ Z_3 $\xrightarrow[(D.E)]{Na}$ Z_4 (hydrocarbon)

CH_3CH_2-OH

Wurtz.

$CH_3-CH_2-CH_2-CH_3$

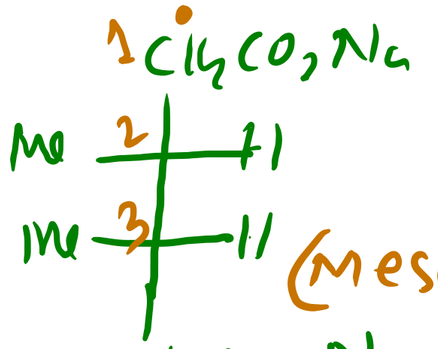
What is the relationship between Z_2 & Z_4.

$Z_2 = Z_4$

$R-C\equiv N \xrightarrow{H_3O^+} RCO_2H + NH_3\uparrow$

CH_3CH_2-Cl

$R-Cl + KCN \rightarrow R-CN + KCl$

1) 

E.L → (Meso compound) 

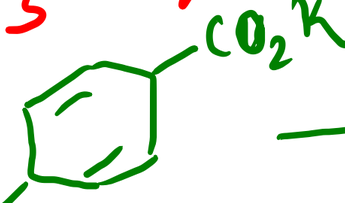
(Meso pdt) (optically inactive) POS present.

(due to inter mol compensation)

$n\ CH_2CO_2Na$

$CH_3-\dot{C}H_2 + CH_3-\dot{C}H_2 \longrightarrow$ $CH_2=CH_2 + CH_3-CH_3$ (minor pdt)

(bi product) ✓

2) 

E.L → 

(Aromatic pdt)

KO_2C

Inha Kolbe (fast reaction).

3) Aqueous solution of potassium propanoate is electrolysed. Total number of possible organic products.

(4)

$CH_3CH_2CO_2Na \longrightarrow CH_3\dot{C}H_2 - \dot{C}O_2 \longrightarrow CH_3-\dot{C}H_2 \longrightarrow CH_3CH_2CH_2-CH_3$

$R_1^{\bullet}$ $R_2^{\bullet}$

1 $CH_3-\dot{C}H_2 + \dot{O}-\overset{\overset{O}{\|}}{C}-CH_2-CH_3 \longrightarrow CH_3CH_2-O-\overset{\overset{O}{\|}}{C}-CH_2-CH_3$ (organic bi product)