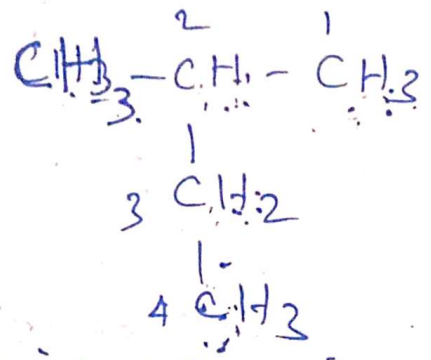
UNIT - IV

Nomenclature of Aliphatic Compounds

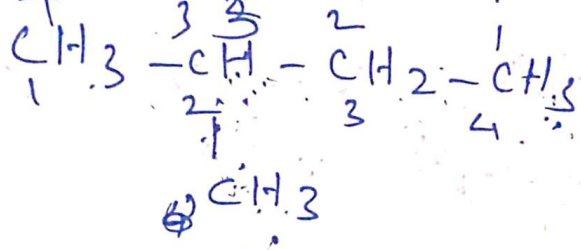
a) 2 முதன்மை கொண்ட சங்கிலி வரை:



2-methyl butane

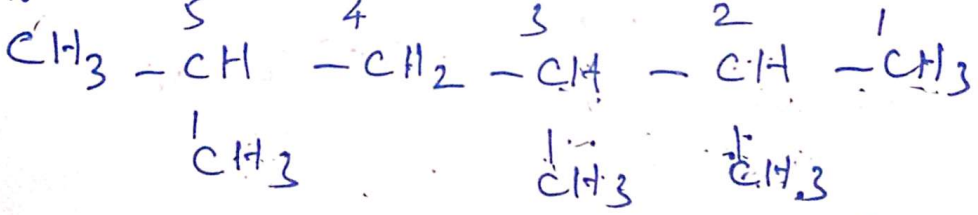
இணைந்த பக்க எண் வரை.

b) (i)



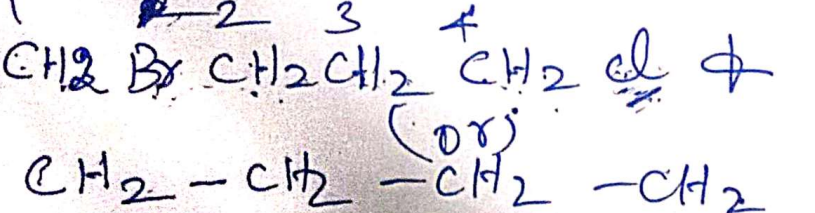
2-methyl butane

(ii)



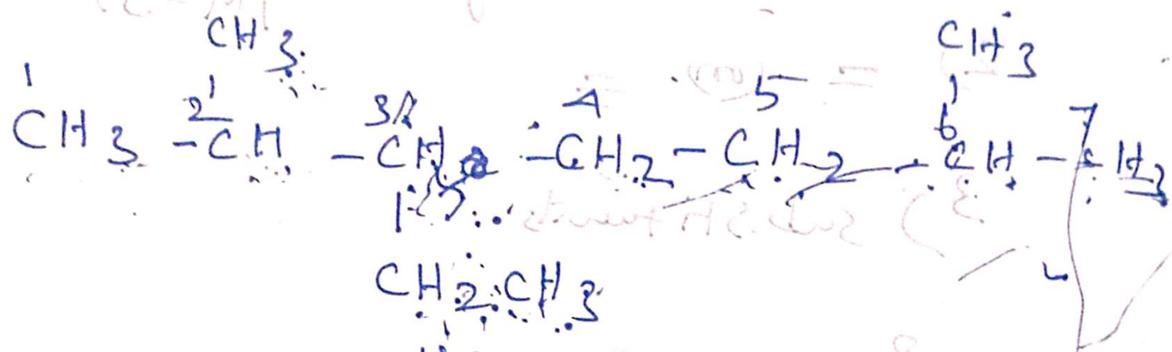
2, 3, 5 trimethyl hexane

(iii)



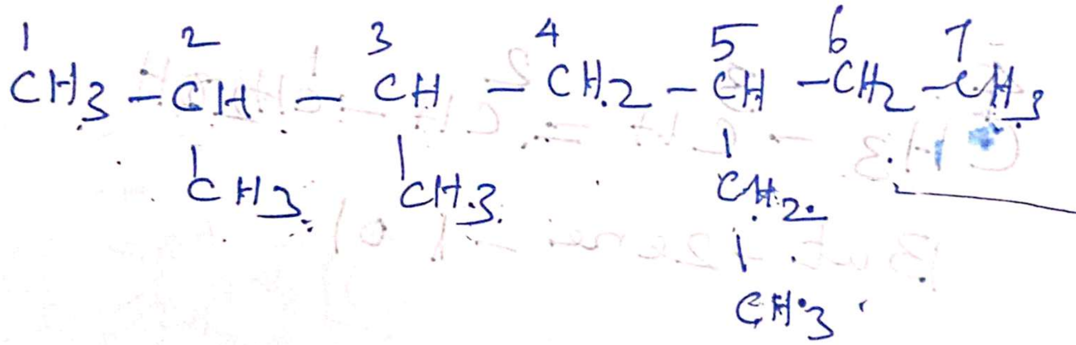
1 bromo -4- chloro butane

(iv)



3- ethyl 2,6 dimethye heptane

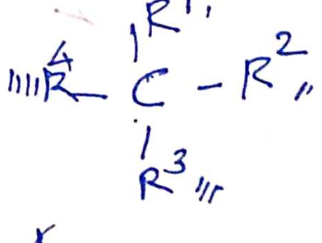
(c) <u>கிளைத்தொடர் அமைப்பு:</u>

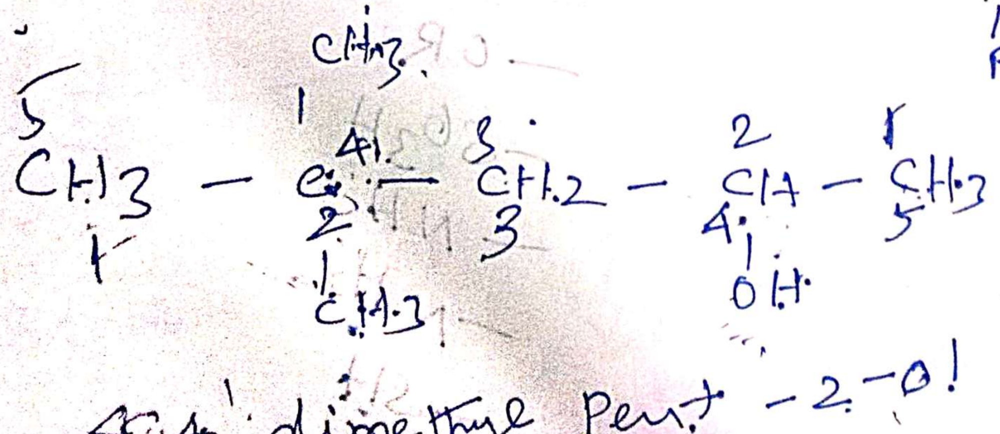


5 - ethyl 2,3 dimethye heptane

d) <u>உதாரணம் நான்கு இணைப்புச் சங்கிலி</u>

<u>ஆல்கஹால்:</u>





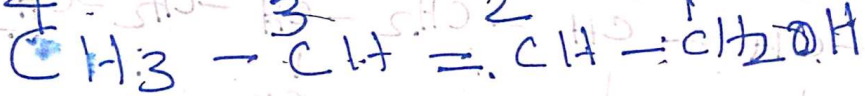
4,4' dimethye Pent -2-ol

1) functional gp — EM-31, TM-37

2) = (or) ≡

3) substituents..

Prop-2-ene-1-ol



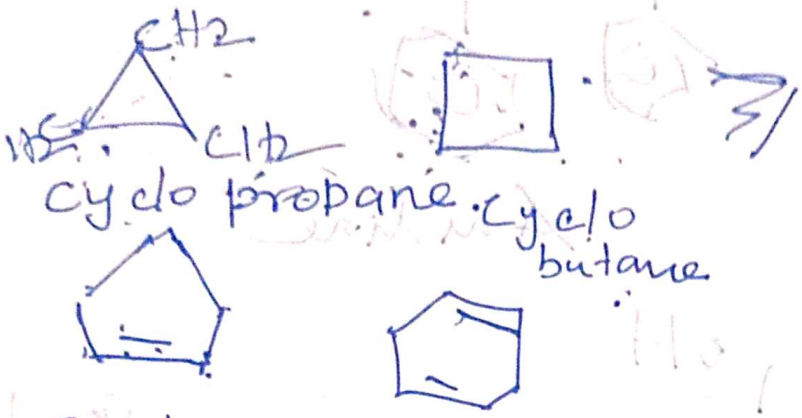
But-2-ene-1-ol

- Br
- Cl
- I
- F

- CO
- NO_2
- OR
- COOH
- OR
- SO_3H
- NH
- NH_2
- SH

- OH
- SR
- CHO

Acyclic Compounds

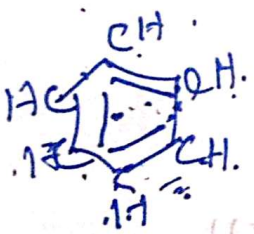


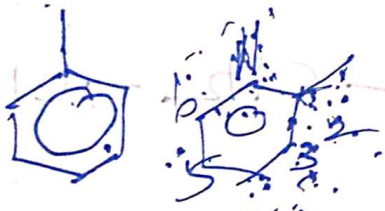
cyclo propane. Cyclo butane

Cyclo pentane Cyclo hexane

Cyclo Pentene Cyclo Hexene

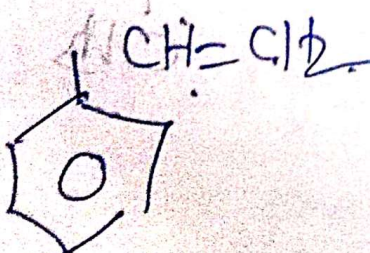
Aromatic Compounds :



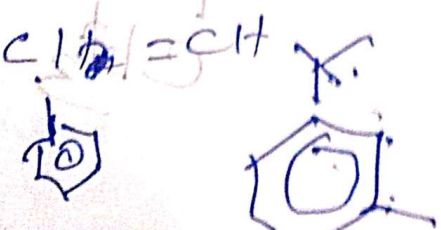


Toulene ortho 1,2 = o
meta 1,3 = m
cyline 1,4 = p

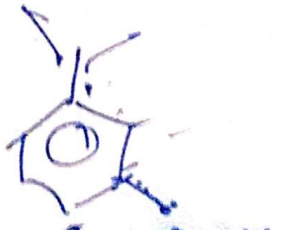
o — Cymenes m — p — mesytelene



Styrene

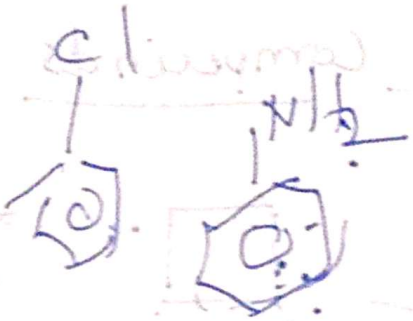


Cumene



Cymenes

benzyne



Aniline

nitro-

phenol

39

(1) $CH_3 - CH_2 - CH_2 - CH_3$

(2) ~~CH~~ $CH_3 - CH = CH - CH_3$

(3) $CH_2 = CH - CH_2OH$

(4) $CH_3 - CH(CH_3) - CH_2 - CH(CH_3) - CH_3$

Alkanes - ஆல்கேன்கள்

* Saturated Compds.
* containing σ bonds only

Free radical rxns of Methane:

மீத்தேனின் தனியுறுப்பு வினை:

$$CH_4 + Cl_2 \xrightarrow[h\nu]{300-400^\circ C} CH_3Cl + HCl$$

Methyl chloride

$$CH_3Cl + Cl_2 \longrightarrow CH_2Cl_2 + HCl$$

Methelene chloride

$$CH_2Cl_2 + Cl_2 \longrightarrow CHCl_3 + HCl$$

Chloroform

$$CHCl_3 + Cl_2 \longrightarrow CCl_4 + HCl$$

Carbon tetra chloride.

Mechanism: வினைவழி வினை:

1) Chain initiation : சங்கிலி ஆரம்பம்

2) " propagation " பரவும்

3) Chain termination " முடியும்

Step I Initiation

$$Cl_2 \xrightarrow{h\nu} Cl^{\bullet} + Cl^{\bullet}$$

Step II Propagation

$$Cl^{\bullet} + CH_4 \longrightarrow {}^{\bullet}CH_3 + HCl$$

$${}^{\bullet}CH_3 + Cl_2 \longrightarrow CH_3Cl + Cl^{\bullet}$$

$$Cl^{\bullet} + CH_3Cl \longrightarrow HCl + {}^{\bullet}CH_2Cl$$

$${}^{\bullet}CH_2Cl + Cl_2 \longrightarrow CH_2Cl_2 + Cl^{\bullet}$$

$$Cl^{\bullet} + CH_2Cl_2 \longrightarrow HCl + {}^{\bullet}CHCl_2$$

$${}^{\bullet}CHCl_2 + Cl_2 \longrightarrow CHCl_3 + Cl^{\bullet}$$

$$Cl^{\bullet} + CHCl_3 \longrightarrow HCl + {}^{\bullet}CCl_3$$

$${}^{\bullet}CCl_3 + Cl_2 \longrightarrow CCl_4 + Cl^{\bullet}$$

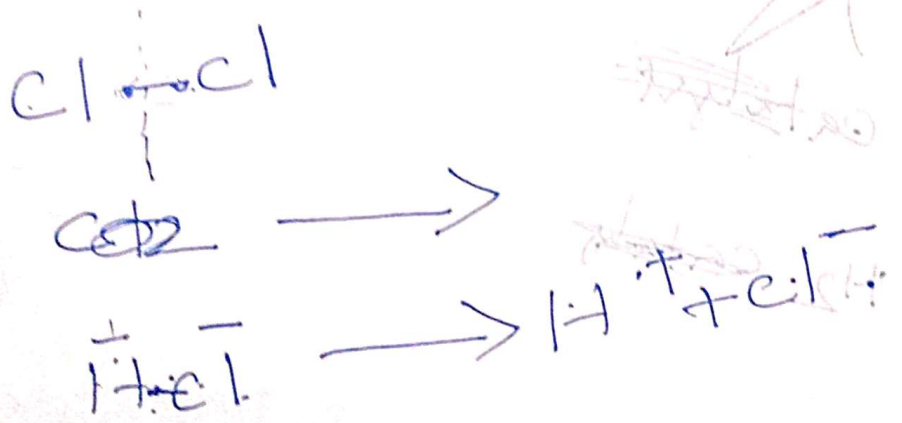
Step III Termination

$\overset{\bullet}{Cl} + \overset{\bullet}{Cl} \longrightarrow Cl_2$ chlorine

$\overset{\bullet}{CH_3} + \overset{\bullet}{CH_3} \longrightarrow CH_3-CH_3$ Ethane

$\overset{\bullet}{CH_3} + \overset{\bullet}{Cl} \longrightarrow CH_3Cl$ methyl chloride

$Cl_2 \longrightarrow \overset{\bullet}{Cl} + \overset{\bullet}{Cl}$



Cracking of petrol :

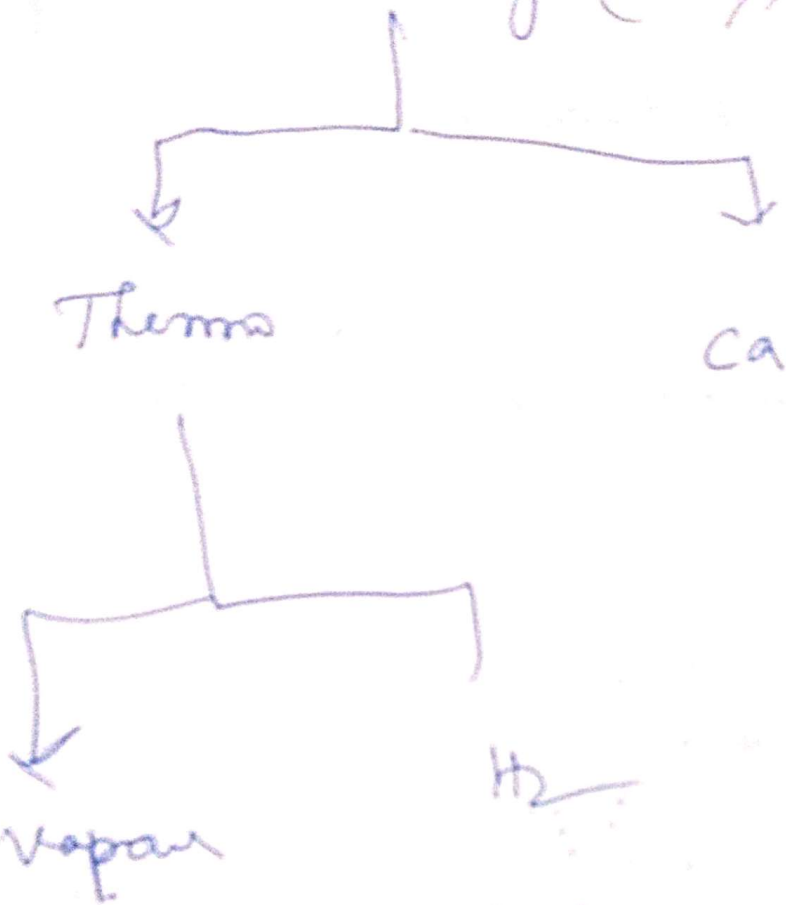
C_8H_{18} n-octane

$\longrightarrow C_6H_{14}$ n-hexane $+ C_2H_4$ Ethylene

$\longrightarrow C_4H_{10} + C_2H_4 + CH_4 + C$

C_4H_{10} n-butane

Cracking (கிராக்கிங்)



7 Petroleum : பெட்ரோலியம்

(1) வெப்ப சிதைவு முறை : Thermo lytic Process

(a) Cracking with Steam : நீராவியுடன் சிதைவடையச் செய்தல்

b) H_2 : ஹைட்ரஜனை சேர்த்து செய்தல்

(2) ஒரு வகை ஊக்கியைச் சேர்த்து செய்தல்

Catalytic Coracking

① Thermolytic Steam:

- Hydrocarbon + 700–900°C → Ethylene, propalene & butadiene.

② Using H_2

Hydrocarbon + 250–450°C → (High Pressure)

③ Catalytic

Hydrocarbon + 450–500°C, 2 atm → High quality petrol

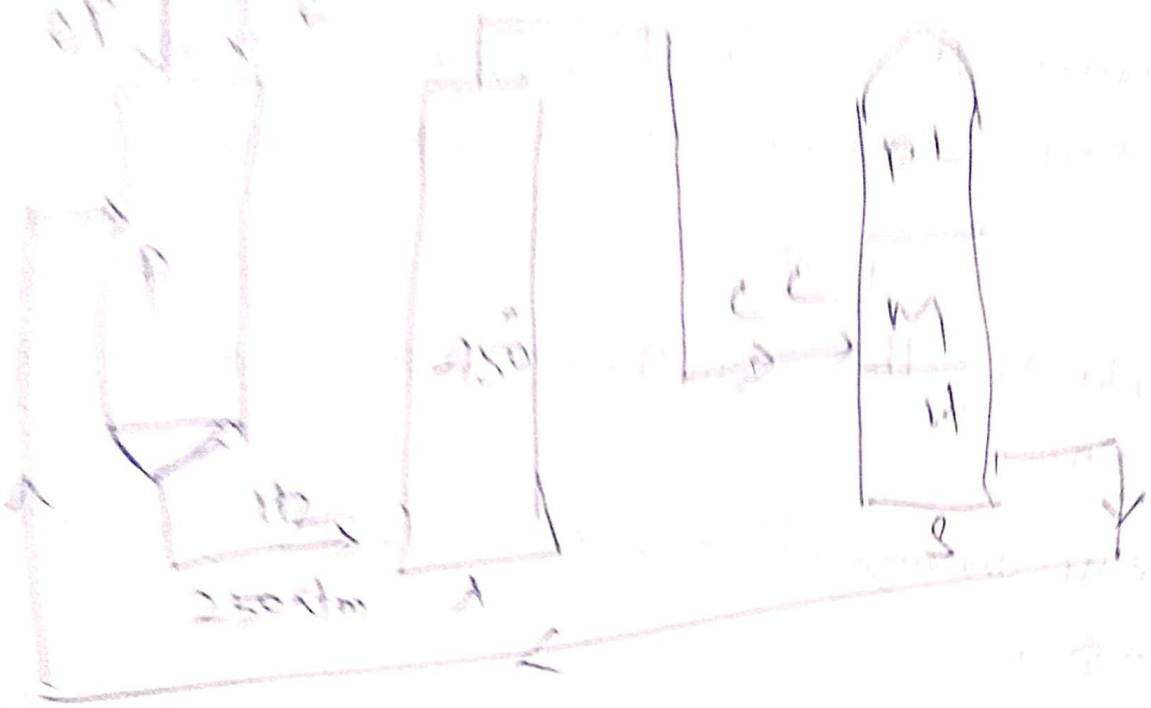
1:1:4
silica : Alumina : MnO_2

Importance:

* Several Compds obtained
& CH_4, ethane, Ethylene, propane, butane, butene, isobutene obtained.
* above six carbonds Compound converted aromatic Comp^s.

Synthetic petrol industry equation

(1) Fischer Tropsch (2) Bergius



CP – நீராவி மாற்றம்

P : நீர்ம நை , H = ஹைட்ரஜன் C = கார்பன்

A = மோனாக்சைடு S = சல்பர் M = மெத்தனால்

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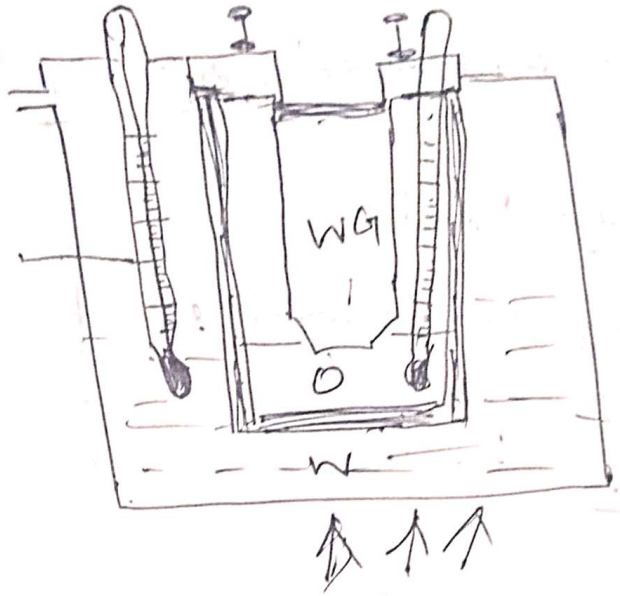
2) $nCO + (2n+1)H_2 \longrightarrow C_nH_{2n+2} + nH_2O$

① தீப்பற்றும் வெப்பநிலை : Flash point



W = Water
WG = glass fragmentation தினுசை
O – oil
H = Heat வெப்பம்

② எரிதல் வெப்பநிலை : Fire point

③ எரியும் வெப்பநிலை

④ பயன் :

ஆவையாக கூடிய மாசுகள் கலந்திருப்பதைக் கண்டுபிடிக்க flash & Fire point பயன்படுகிறது.

⑤ புகைதல் வெப்பநிலை : Smoke point

எண்ணெய் ஆவிகள் தீப்பற்றாமல், வெடிக்காமல் புகையை மட்டும் தரும்

ஆக்டேன் எண் : octane number :

n-heptane, 2,2,4 trimethyl pentane

Cetane எண்: ஹெப்டேன்

Cetane - α - methyle naphthalene mixture

ஆன்டிநாக்கிங் ஏஜென்ட்ஸ் ஆக பயன்படும் சேர்மங்கள் Anti knocking agents:

TEL - tetra Ethyl Lead

Lead + Petrol + Ethylene bromide

↓

evolve $PbBr_2$

↓

mixing in air

↓

Cause pollution

Develop the octane no:

i) 570°K $AlCl_3$ + Petrol → pentane → isopetenane
62 90

ii) Alkylation:

Petroleum —cracking→ iso butalene → iso octane

iii) Aromatization:

Crued naphtha vapour —770K, Pt→ Straight alkanes → line

Benzene
Toulene + Xylene (BTX)

power Alcohol:

① 100% ⟶ power alcohol.
Ethyl alcohol.

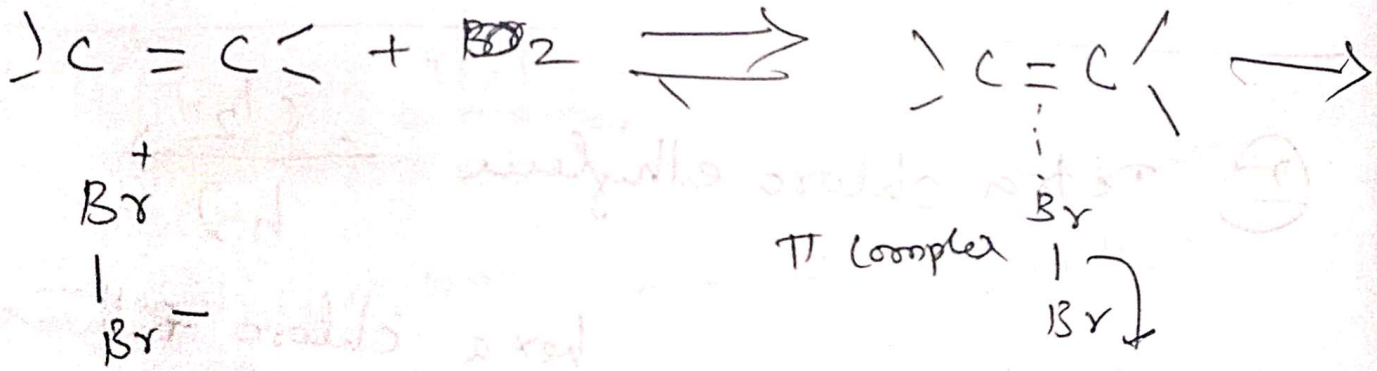
~~petrol + alcohol ⟶ motor spirit~~

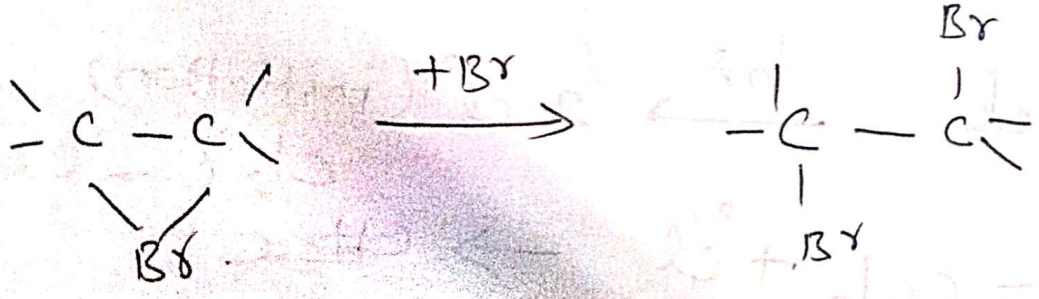
② 25% power alcohol + 75% petrol } ⟶ motor spirit

③ 95% Alcohol + 5% H_2O } ⟶ industrial alcohol (or rectified spirit.

9.10.20

Alkenes





π-complex

Free radical reaction:

(1) $CH_2=CH_2 + Cl_2 \xrightarrow{h\gamma} CH_2(Cl)-CH_2Cl$

Ethylene chloride

$Cl_2 \xrightarrow{h\gamma} \dot{Cl} + \dot{Cl}$ (Initiation)

$CH_2=CH_2 + \dot{Cl} \longrightarrow CH_2Cl-\dot{C}H_2$

$CH_2Cl-\dot{C}H_2 + Cl_2 \longrightarrow CH_2(Cl)-CH_2Cl + Cl^{\cdot}$

$2\,CH_2Cl-\dot{C}H_2 \longrightarrow CH_2(Cl)-(CH_2)_4-CH_2Cl$

---

(2) Tetra chloro ethylene $\xrightarrow[h\nu]{Cl_2}$

hexa chloro ethane

$Cl-Cl \xrightarrow{h\nu} 2\,Cl^{\cdot}$ (initiation)

$Cl_2C=CCl_2 + \dot{Cl} \longrightarrow Cl_2\dot{C}-CCl_3$

$$Cl_2C + CCl_3 + Cl_2 \longrightarrow Cl_3C - CCl_3 + Cl$$

Addition reactions:

1. H2 2 Loss:

$$CH_2 = CH_2 + H_2 \xrightarrow[200-300^\circ C]{Ni} CH_3 - CH_3$$

ethane

2. React with halogen:

$$CH_2 = CH_2 + Br_2 \xrightarrow{CCl_4} \underset{\displaystyle Br \quad Br}{CH_2 - CH_2}$$

1, 2 dibromo ethane

$$CH_3 - CH = CH_2 + Br_2 \xrightarrow{CCl_4} \underset{\displaystyle Br \quad Br}{CH_3 - CH - CH_2}$$

3) Hydrogen Halide:

$$CH_2 = CH_2 + HX \longrightarrow CH_3 - CH_2X$$

$$CH_3 - CH = CH_2 + HI \longrightarrow \begin{cases} CH_3CH_2CH_2I \\ CH_3 - \underset{\displaystyle I}{CH} - CH_3 \end{cases}$$

iso propyl

Addition to unsymmentrical alkenes:

Markownikoff's Rules:

$$CH_3-CH=CH_2 + H^{\delta+}I^{\delta-} \longrightarrow CH_3CH_2-CH_2I$$

$$CH_3-CH=CH_2 + H^{\delta+}I^{\delta-} \longrightarrow CH_3-CHI-CH_3$$

mechanism:

$$CH_3-CH=CH_2 \rightleftharpoons CH_3-CH=CH_2 \longrightarrow$$

$H-I$; H^+ ; I^-

$$CH_3-\overset{+}{C}H-CH_3 \xrightarrow{I^-} CH_3CH(I)CH_3$$

$$CH_3-CH=CH_2 + HBr \longrightarrow CH_3CH_2Br$$

$$CH_3-CH=CH_2 + HBr \longrightarrow CH_3CHBr-CH_3$$

Peroxide effect:

$$CH_3-CH=CH_2 + HBr \xrightarrow{\text{Peroxide}} CH_3-CH_2-CH_2Br$$

$$HBr \xrightarrow{\text{Peroxide}} H^{\bullet} + Br^{\bullet}$$

$$CH_3-CH=CH_2 + Br^{\bullet} \longrightarrow \overset{\bullet}{C}H_3\,CH\,CH_2Br$$

Em - 21
7m - 26

$$\longrightarrow CH_3\,CH_2\,CH_2Br + Br^{\bullet}$$

14.10.20

~~H_2SO_4~~ .

A. Reaction with H_2SO_4

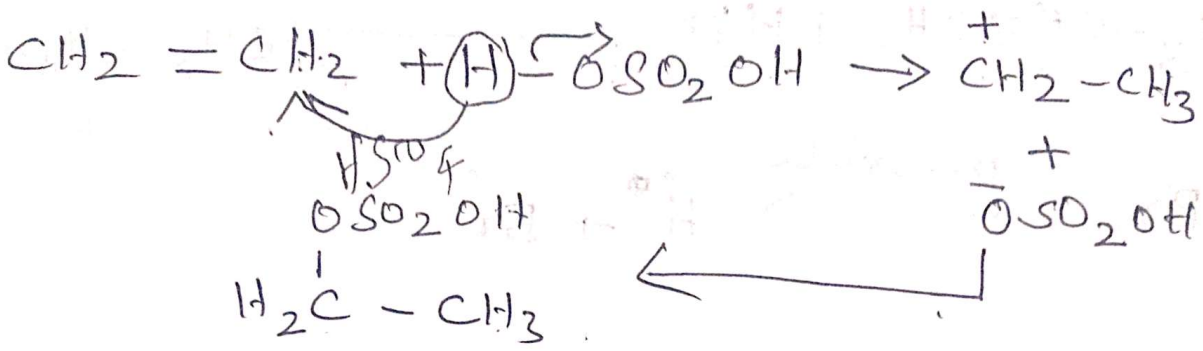
$$>C=C< + H_2SO_4 \xrightarrow{H^+ HSO_4^-} >C(H)-C(SO_3H)<$$

Alkyl hydrogen Sulphate

$$\overset{H}{\underset{H}{}}>C=C<\overset{H}{H} \xrightarrow{H_2SO_4} CH_3CH_2HSO_4$$

Ethylene — Ethyl hydrogen Sulphate

Mechanism: (2)



Unsymmentrical alkenes obey Markovnikoff's rule. (5)

$$CH_3-CH=CH_2 + H_2SO_4 \longrightarrow CH_3-\underset{\underset{HSO_4}{|}}{CH}-CH_3$$

iso propyl hydrogen sulphate

This rxns is important.

(1) $CH_2=CH_2 \xrightarrow{H_2SO_4} CH_3-CH_2-HSO_4 \xrightarrow[H^+ OH^-]{hot\ H_2O} CH_3\cdot CH_2OH + H_2SO_4$

(2)

(4) $CH_3-CH=CH_2 \xrightarrow{H_2SO_4} CH_3CH(HSO_4^-)-CH_3 \xrightarrow{H_2O} CH_3-CH(OH)-CH_3$

iso propyl alcohol

(5) Hydroboration:

immediately react with borane to give alkyl boranes.

$2\,CH_3CH=CH_2 + (BH_3)_2 \longrightarrow 2\,CH_3CH_2CH_2BH_2$

n-propyl borane

$CH_3CH_2CH_2BH_2 + CH_3-CH=CH_2 \longrightarrow (CH_3CH_2CH_2)_2BH$

di n-propyl borane

$(CH_3CH_2CH_2)_2BH + CH_3-CH=CH_2 \longrightarrow (CH_3CH_2CH_2)_3B$

tri n-propyl borane

B is e^- deficiency in BH_3. & it acts as electrophile.

$$(CH_3CH_2CH_2)_3B + 3H_2O_2 \xrightarrow{(O)}$$

$$CH_3CH_2CH_2OH + H_3BO_3$$

propyl alcohol — Boric acid

6. Hydration:

$$C_2H_4 + H_2O \xrightarrow{H_3PO_4} C_2H_5OH$$

$$(CH_3)_2C=CH_2 + H_2 \xrightarrow{H^+} (CH_3)_3C-OH$$

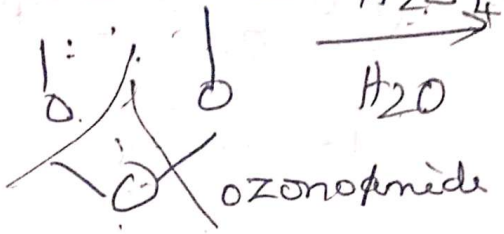
t-butyl alcohol.

7. ozonolysis:

1) Ozonolysis:

1. Symmetrical olefins:

$$CH_2=CH_2 + O_3 \xrightarrow{H_2O/Zn} CH_2-CH_2 \xrightarrow[H_2O]{H_2SO_4}$$



ozonoprnide

$$2HCHO + H_2O_2$$

Formaldehyde
CH_2O

$$(CH_3)_2C=C(CH_3)_2 \xrightarrow{O_3/H_2O/Zn} 2(CH_3)_2CO$$

2,3 dimethyl bute-2-ene — acetone

(ii) Unsymmetrical olefins

$$CH_3-CH=CH_2 \xrightarrow[H_2O/Zn]{O_3} CH_3CHO + HCHO$$

$$CH_3-\underset{CH_3}{\overset{|}{C}}=CH-CH_3 \xrightarrow{2,} CH_3-\underset{CH_3}{\overset{|}{C}}=O + CH_3CHO$$

$$CH_3-CH_2-CH=CH_2 \xrightarrow{1,} CH_3CH_2CHO + CH_2O$$

1-butene

$$CH_3-CH=CH-CH_3 \xrightarrow{\text{,,}} 2CH_3CHO$$

$$(CH_3)_2C=CH_2 \xrightarrow[H_2O/Zn]{O_3} (CH_3)_2CO + HCHO$$

iso butene

22.10.20

8. $KMNO_4$ உடன் வினை:

$$CH_2=CH_2 + H_2O + [O] \xrightarrow{alk.\,KMnO_4} \underset{OH}{CH_2}-\underset{OH}{CH_2}$$

glycol

$$CH_3-CH=CH_2 + H_2O + [O] \xrightarrow{KMnO_4} CH_3-\underset{OH}{CH}-\underset{OH}{CH_2}$$

propylene glycol

decolourisation of $KMnO_4$. idenfication of double bond in ~~alkene~~. compds

⑨ NBS - allylic substitution:

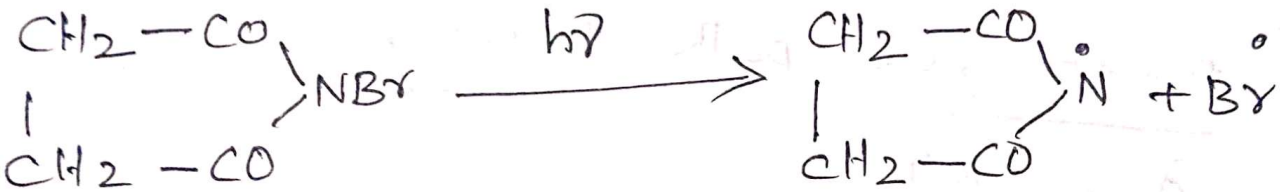
$$CH_3-CH=CH_2 + NBS \longrightarrow CH_2(Br)-CH=CH_2$$

propene

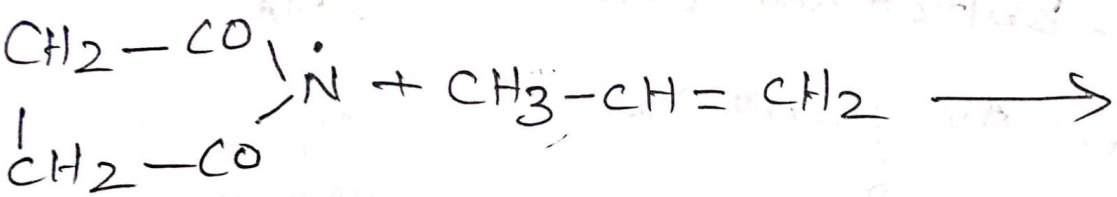
follow radical rxns

Mechanism:

I



II



$^{\bullet}CH_2-CH=CH_2$ + succinimide

allylic radical

III

$$Br^{\bullet} + {}^{\bullet}CH_2-CH=CH_2 \longrightarrow Br-CH_2-CH=CH_2$$

allyl bromide.