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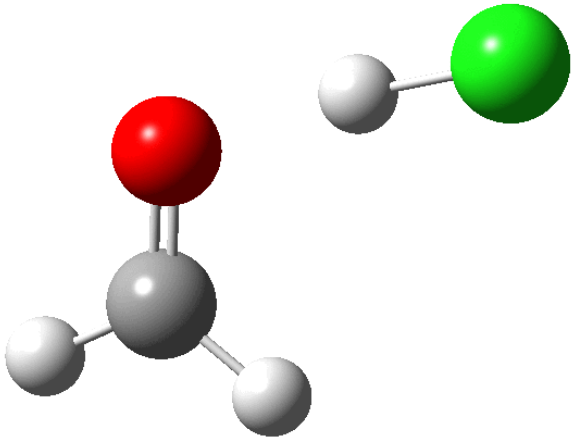

Electrophilic & Free Radical Addition Reaction

B.Sc. Sem – VI
Paper : CC CH : 602
Unit – 1

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SYLLABUS

- Addition to carbon – carbon double bond
- Markonikovs rule
- Electrophilic addition, orientation, reactivity
- Reaarangement, Dimerization, Alkylation
- Peroxode effect (Anti-markonikov)
- Free radical addition, Mechanism of peroxide initiated addition of HBr
- Syn and anti addition mechanism for addition of halogens
- Electrophilic addition to conjugated dienes (1:2 v/s 1:4 addition)
- Free radical addition to conjugated dienes & reactivity

- Organic chemistry by morrisson & boyed : Vth edition
- Advanced organic chemistry by R.K.Bansal
- Organic chemistry by I.L.Finar volume I & II (Vth edition)
- Organic reaction & mechanism IInd edition by P.S.Kalsi
- Organic chemistry by S.M.Mukharjee, S.P.Singh, R.P.Kapoor

REFERENCE BOOKS

COs : Course Outcomes

To enable students about basic knowledge of Markonikovs & Anti-Markonikovs rule, Electrophilic addition, and free radical addition reaction.

- Homolytic Fission & Free Radical
- Heterolytic Fission & Electrophile
- Electrophile
- Addition reaction
- Free radicals
- Types of Addition reaction
  - Hydrogenation
  - Halogenation
  - Hydro halogenation
  - Hydration

Electrophile : Cation or Neutral molecule which are obtai ned by heterolytic fission and have tendency to accept electron pair is known as electrophile. eg. NO_2^+, Cl^+, SO_3H^+ etc.

Free Radical : Atoms which are obtained by homolytic fission and having unpaired electrons are called free radical.

Addition Reaction : Unsaturated compound convert into saturated compound without loss of atoms.

Type of Reactions

01

Addition Reaction : One molecule combine with other molecule and form new compound without loss of atoms.

02

Elimination Reaction: A pair of atoms or groups of atoms are removed from a molecules

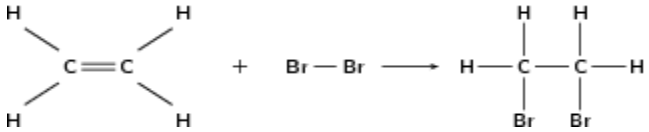
03

Substitution Reaction: One functional group is replaced by another functional group

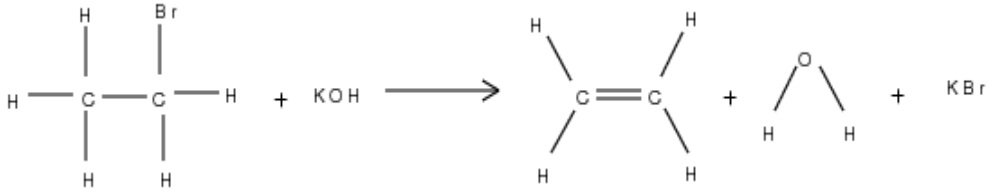
04

Rearrangement Reaction: Substituent moves from one atom to another atom in the same molecule.

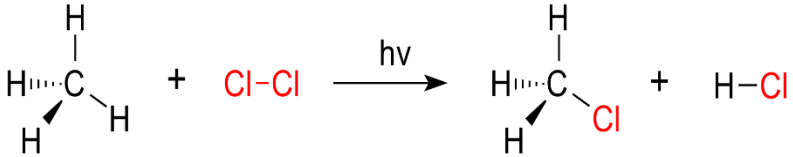
Addition Reaction



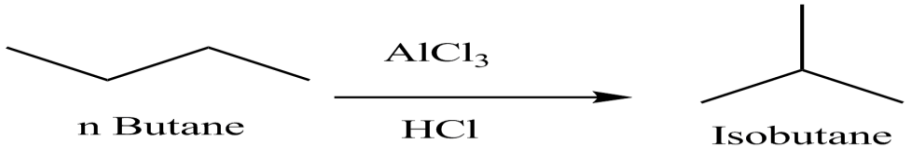
Elimination Reaction

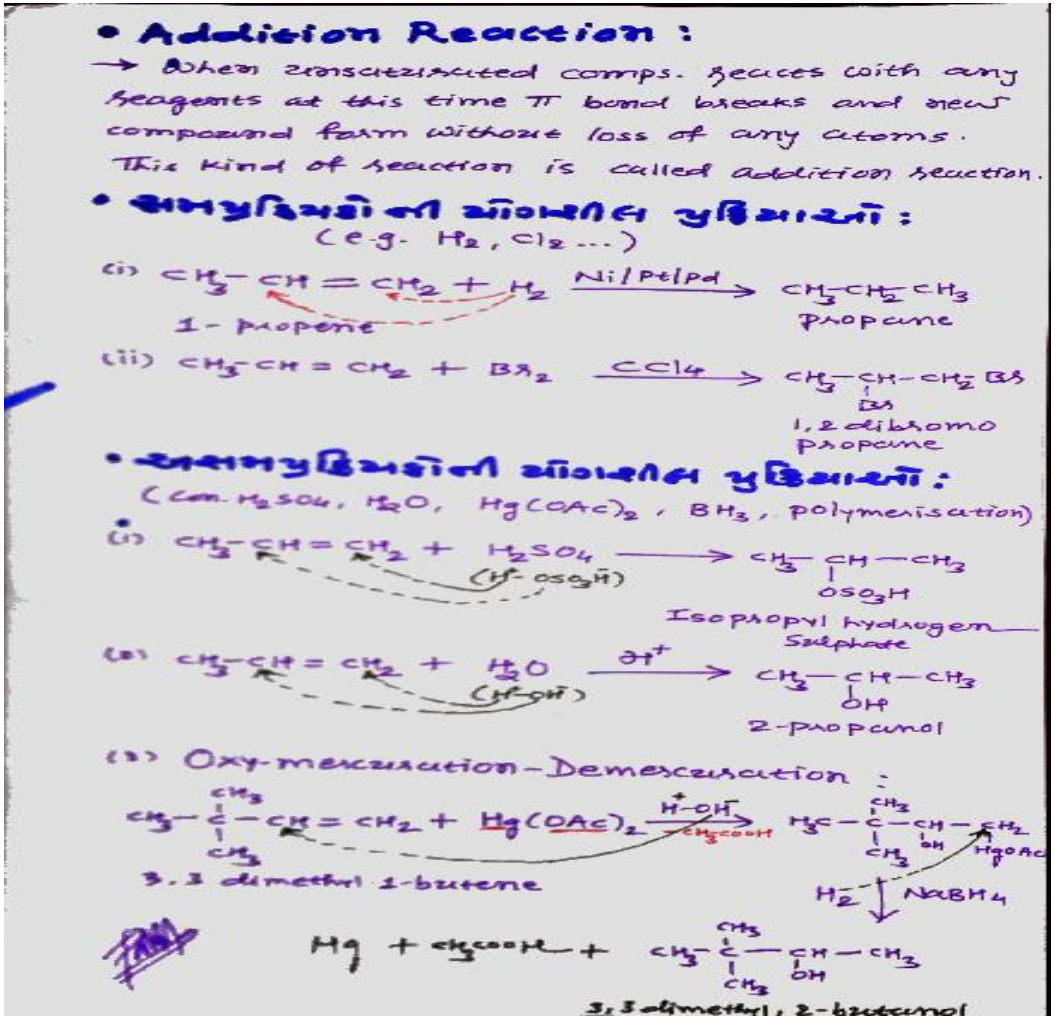


Substitution Reaction

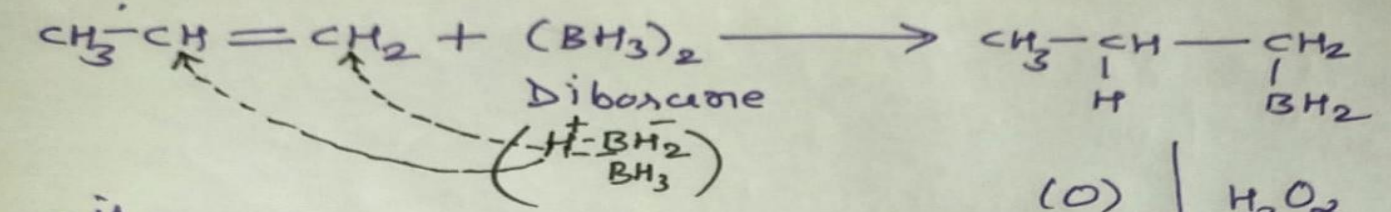


Rearrangement Reaction




• Addition Reaction :
→ When unsaturated comps. reacts with any reagents at this time π bond breaks and new compound form without loss of any atoms. This kind of reaction is called addition reaction.
• અસમપ્રમાણ આલ્કેનની સંકલનની પ્રક્રિયાઓ :
(e.g. H_2, Cl_2 ...)
(i) $CH_3-CH=CH_2 + H_2 \xrightarrow{Ni/Pt/Pd} CH_3-CH_2-CH_3$
1- propene
propane
(ii) $CH_3-CH=CH_2 + Br_2 \xrightarrow{CCl_4} CH_3-CH(Br)-CH_2Br$
1,2 dibromo propane
• અસમપ્રમાણ આલ્કેનની સંકલનની પ્રક્રિયાઓ :
(Con. H_2SO_4, H_2O, $Hg(OAc)_2$, BH_3, polymerisation)
(i) $CH_3-CH=CH_2 + H_2SO_4$ ($H^+ -OSO_3H$) → $CH_3-CH(OSO_3H)-CH_3$
Isopropyl hydrogen Sulphate
(ii) $CH_3-CH=CH_2 + H_2O \xrightarrow{H^+}$ ($H^+ -OH$) → $CH_3-CH(OH)-CH_3$
2-propanol
(3) Oxy-mercuration-Demercuration :
$CH_3-C(CH_3)_2-CH=CH_2 + Hg(OAc)_2 \xrightarrow[CH_3COOH]{H-OH}$
3,3 dimethyl 1-butene
$H_3C-C(CH_3)_2-CH(OH)-CH_2-HgOAc$
H_2 / $NaBH_4$
$Hg + CH_3COOH +$ $CH_3-C(CH_3)_2-CH(OH)-CH_3$
3,3 dimethyl, 2-butanol

(4) Hydroboration - Oxidation (Anti Markovnikov)



(O) $\downarrow H_2O_2$

$\oplus \quad \oplus \quad BH_3 + CH_3-CH_2-CH_2-OH$

1-Propanol

(5) Polymerisation :

$n(CH_2=CH_2) \xrightarrow[\text{peroxide}]{O_2/\Delta} \left[CH_2-CH_2\right]_n$

Ethene — Polythene

Markonikov's Rule

Markonikov's Rule

01 Rule

02 Examples

03 Mechanism

04 Other examples

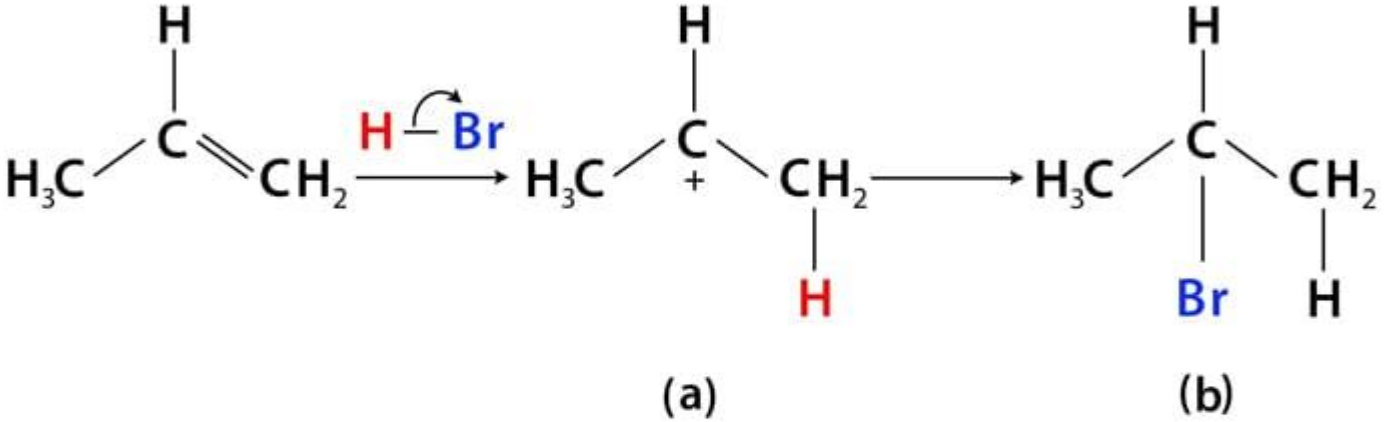
05 Potential energy diagram

Markonikov's Rule :

Markonikov's rule also known as Markownikoffs rule. The Russian chemist Vladimir Vasilyevich Markonikov first formulated this rule in 1865.

Rule : When an unsymmetrical alkene reacts with an unsymmetrical reagent then more positive part of unsymmetrical reagent goes to the carbon that have more hydrogen atoms.

Markovnikov's Rule Basic Mechanism



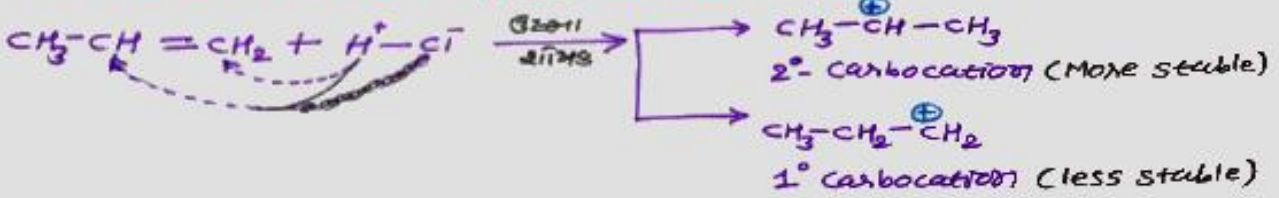
(a) •hydrogen (H) added to 1° carbon (C) for more stable carbocation

(b) •bromine (Br) added to 2° carbocation to give product

ChemistryLearner.com

* Mechanism : This reaction will be complete in two steps :

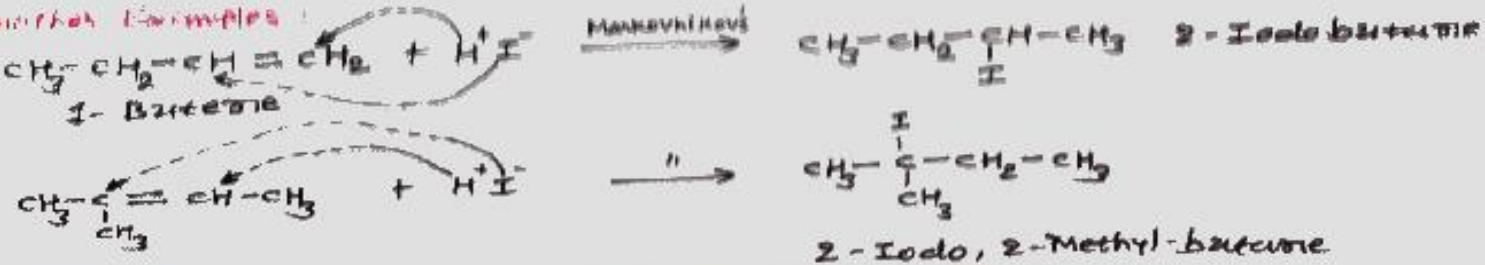
Step - I

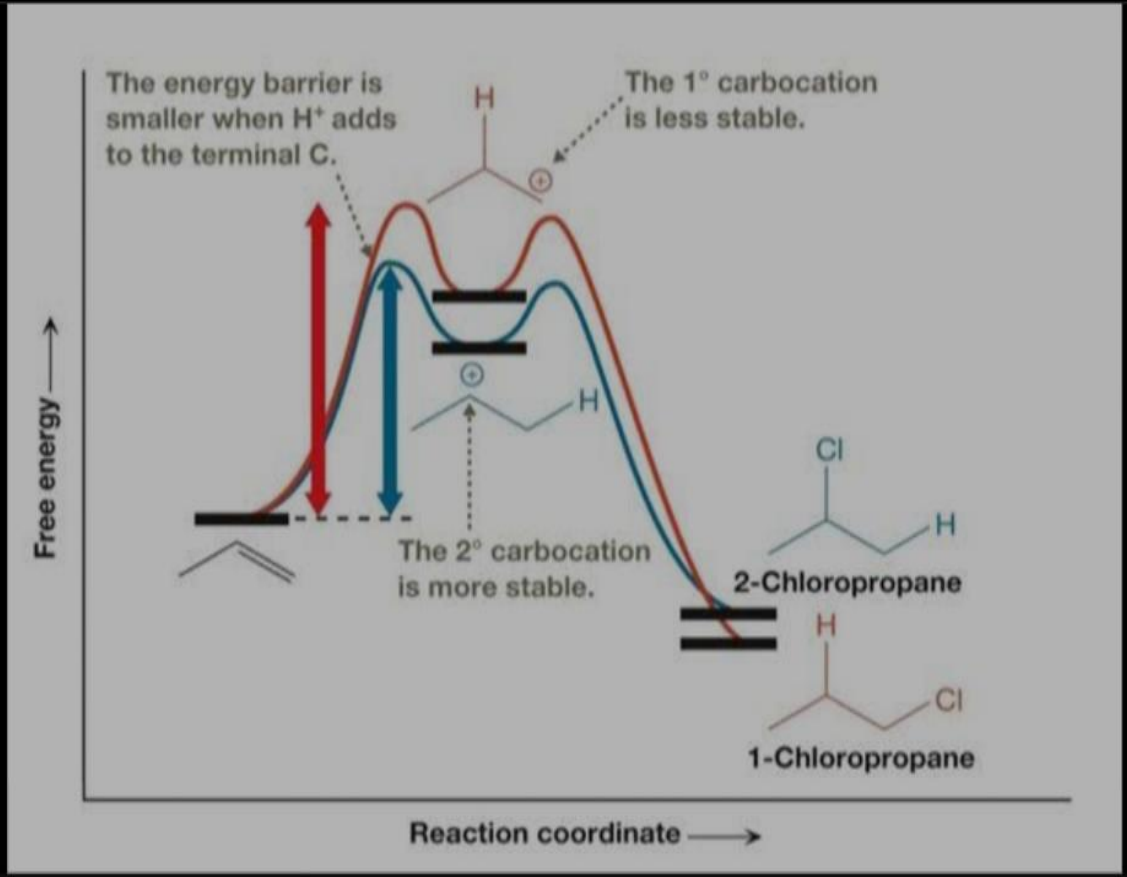


→ અહીં પ્રથમ તબક્કો ફાસ્ટ છે. આપણે જોયું કિનેટિક તબક્કો છે. આ તબક્કા દરમિયાન 2° કાર્બોકેટાયન બને છે જેના માટે ΔG_2 નું મૂલ્ય ઓછું છે આથી બેમાંથી બીજા તબક્કામાં નીચા મૂલ્ય ઝડપથી ઉત્પન્ન થાય છે. જ્યારે 1° કાર્બોકેટાયન માટે ΔG_1 નું મૂલ્ય વધુ છે આથી તે પ્રમાણમાં ઓછો રચાય છે.

Step - II

* Another Examples :





Anti Markonikov's Rule: (Free Radical Addition)

01 Rule

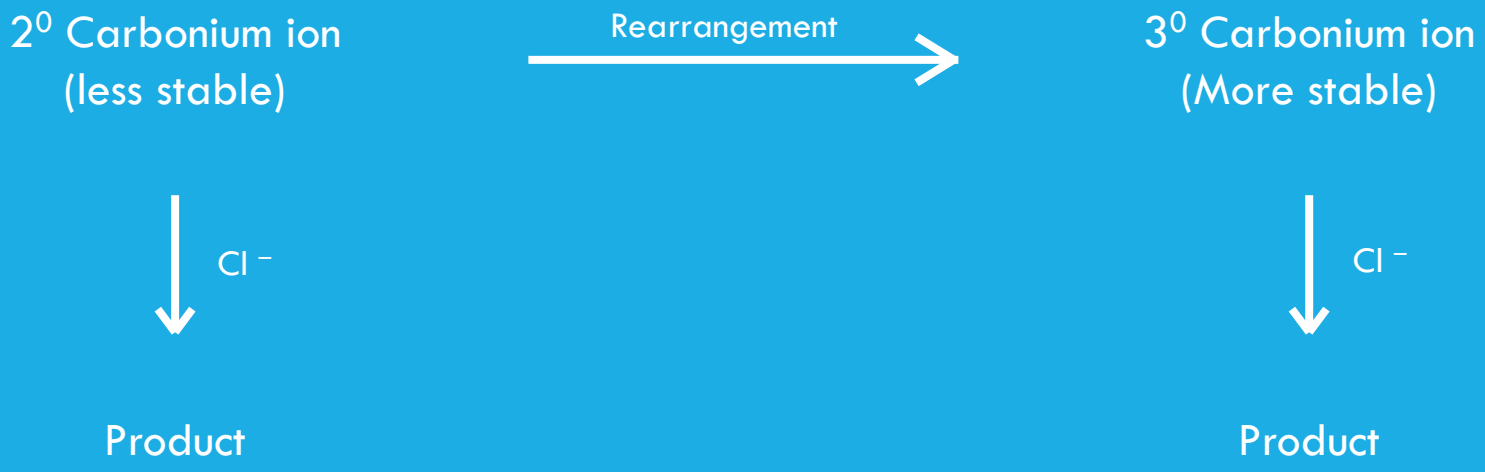
02 Examples

03 Mechanism

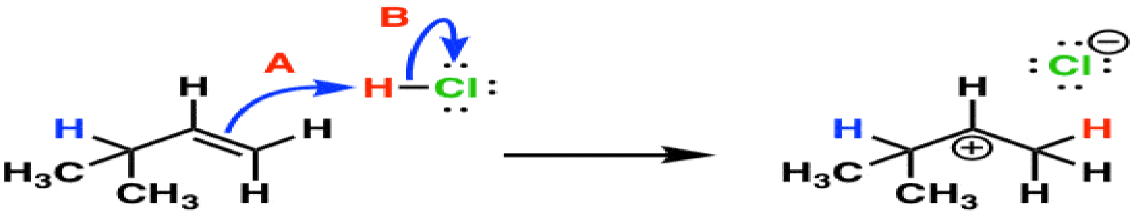
04 Other examples

Anti Markonikov's Rule:
(Free Radical Addition)

Electrophilic Addition : Rearrangement



Step 1 - attack of alkene on H–Cl (arrows A and B)



	Form		Break
A	C_1–H	A	C_1–C_2 (π)
	C_2–H		C_3–H
	C_3–Cl	B	H–Cl

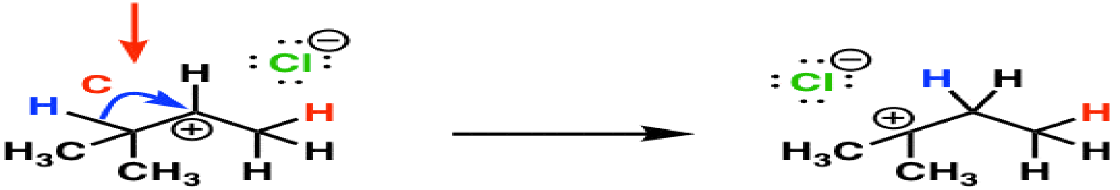
Observation: secondary carbocation

Step 2 - rearrangement (arrow C)

Recall the order of carbocation stability: tertiary > secondary > primary

Migration of the C–H bond from C_3 to C_2 results in a more stable carbocation!

This arrow says, "break the C_3–H bond and form a new C_2–H bond"



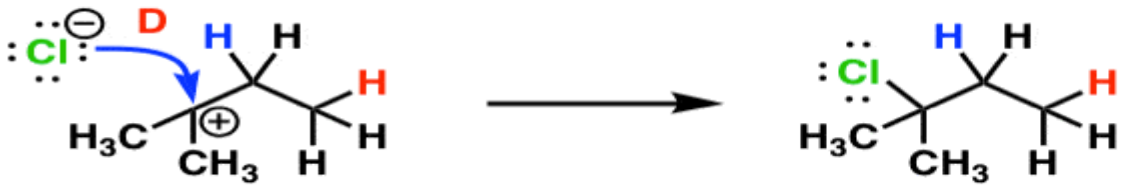
	Form		Break
	C_1–H		C_1–C_2 (π)
C	C_2–H	C	C_3–H
	C_3–Cl		H–Cl

Secondary carbocation

Tertiary carbocation

a more stable carbocation

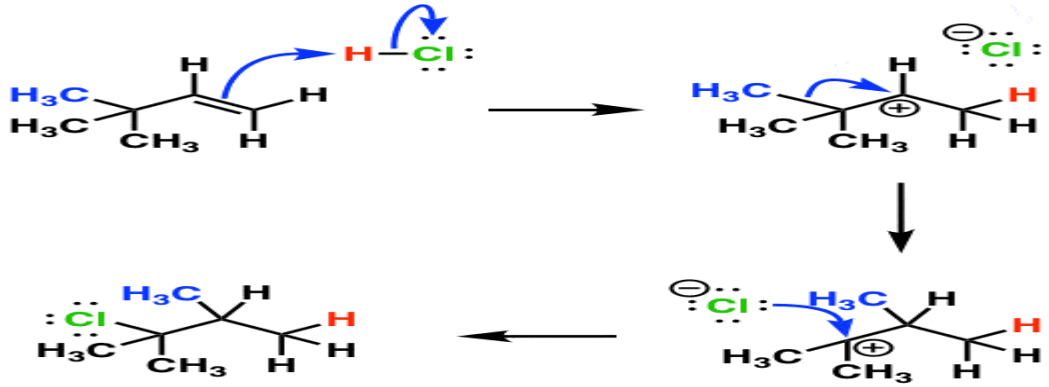
Step 3 - Attack of nucleophile (arrow D)



Tertiary carbocation

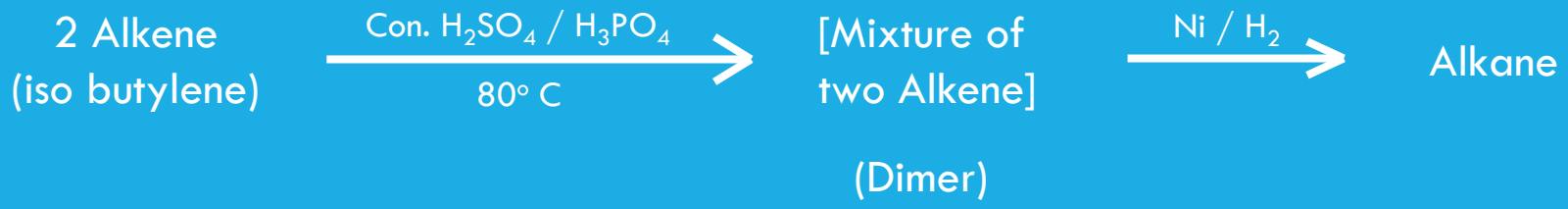
	Form	Break
	C_1–H	C_1–C_2 (π)
	C_2–H	C_3–H
D	C_3–Cl	H–Cl

Alkyl shift example:



Electrophilic Addition : Dimerization

(Dimerization of Isobutylene)



Isobutylene + H^+ → 3^0 Carbonium ion (less stable)

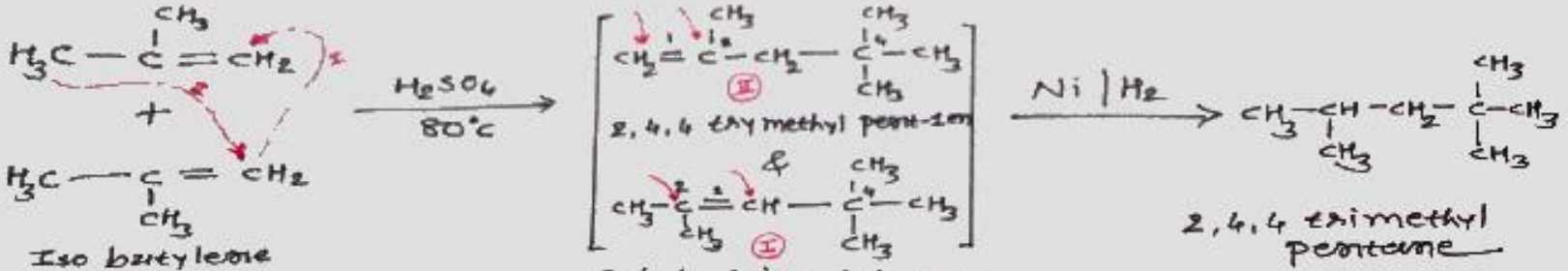
Isobutylene + 3^0 Carbonium ion → 3^0 Carbonium ion (More stable)

3^0 Carbonium ion $\xrightarrow{-H^+}$ 2,4,4 tri methyl 1-pentene
&
2,4,4 tri methyl 2-pentene

↓ Ni / H_2

2,4,4 tri methyl pentane

* Electrophilic Addition : Dimerisation : (Brüstlew)

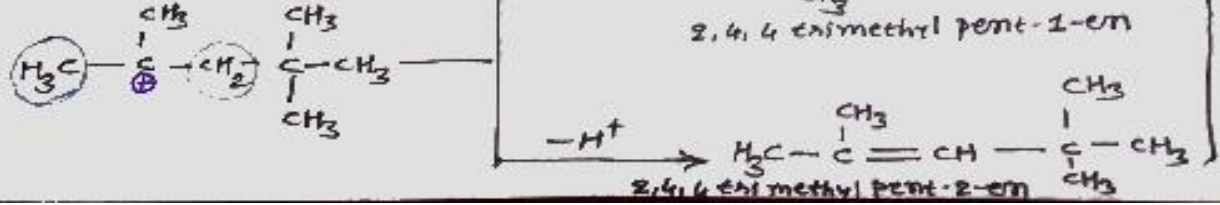


* Mechanism :

Step-I : $CH_3-\underset{CH_3}{\overset{CH_3}{C}}=CH_2 + H^+ \longrightarrow H_3C-\overset{\oplus}{\underset{CH_3}{\overset{CH_3}{C}}}-CH_3$ (3° carbonium ion)

Step-II : $CH_3-\underset{CH_3}{\overset{CH_3}{C}}=CH_2 + \overset{\oplus}{\underset{CH_3}{\overset{CH_3}{C}}}-CH_3 \longrightarrow H_3C-\underset{\oplus}{\overset{CH_3}{\underset{CH_3}{C}}}-CH_2-\underset{CH_3}{\overset{CH_3}{C}}-CH_3$ (More stable 3° carbocation)

Step-III :

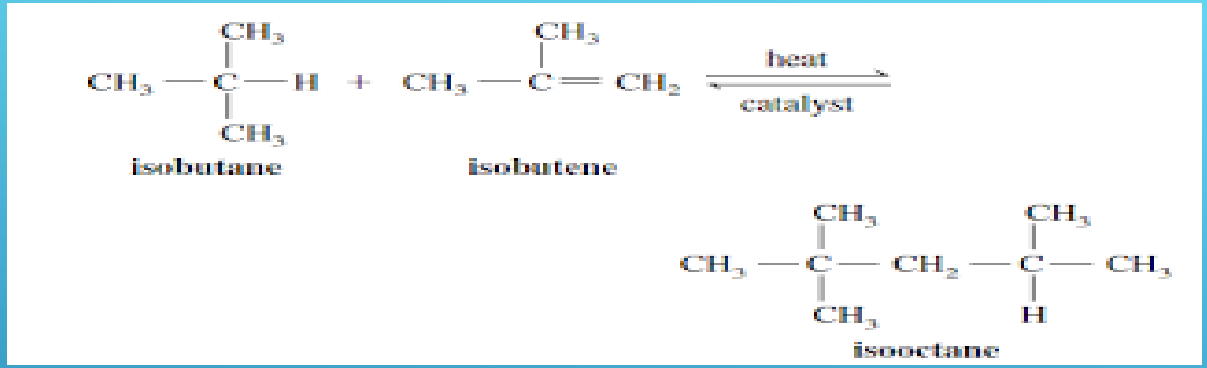


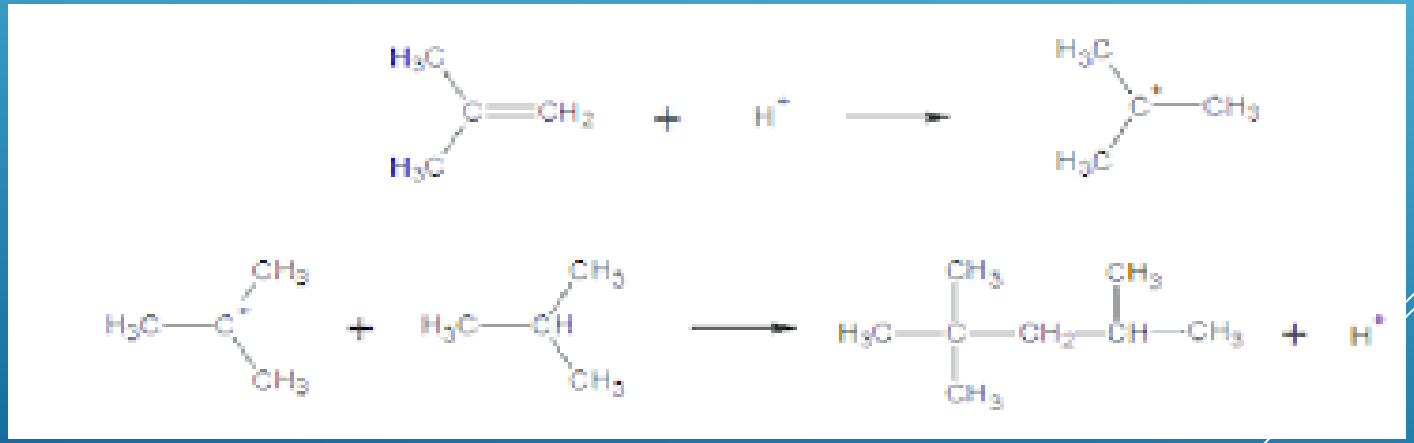
Electrophilic Addition : Alkylation

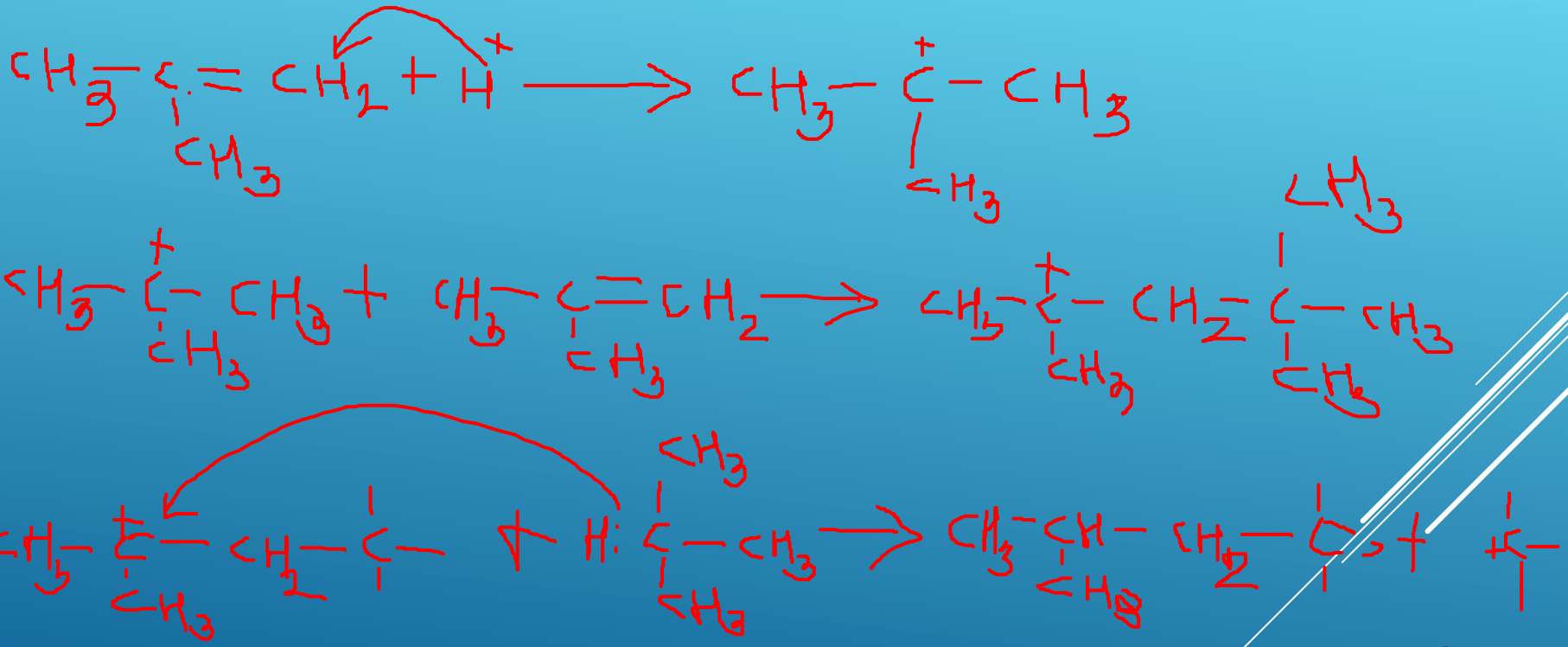
Isobutyline + H^+ ⟶ 3^0 Carbonium ion (less stable)

Isobutyline + 3^0 Carbonium ion ⟶ 3^0 Carbonium ion (More stable)

3^0 Carbonium ion + Isobutane ⟶ Iso-octane + 3^0 Carbonium ion


heat
catalyst
isobutane
isobutene
isooctane





Polymerization of Diene by Free Radical Reaction

1:3 Butadiene	→	Poly 1:3 Butadiene
Isoprene	→	Cis – poly isoprene (Natural Rubber)
Natural Rubber	→	Vulcanized Rubber
chloroprene	→	Polychloroprene

મુક્તમૂલક રીતે ડાઈન નું બહુલીકરણ રબર
તથા તેનાં વિસ્થાયકોની બનાવટ :

Polymerisation of Dien by Free Radical Reaction :

- 1:3 બ્યુટાડાઈન ⟶ પોલિ 1:3 બ્યુટાડાઈન
- આઈસોપ્રિન ⟶ cis પોલિ આઈસોપ્રિન (કુદરતી રબર)
- કુદરતી રબર ⟶ વલ્કે રબર
- આઈસોપ્રિન ⟶ પોલિઆઈસોપ્રિન

⟶ ડાઈન સંયોજનોનું મુક્તમૂલક પ્રક્રિયાવિધિથી બહુલીકરણ કરવાથી રબર કે તેનાં વ્યુત્પન્નો પ્રાપ્ત થાય છે.

e.g.

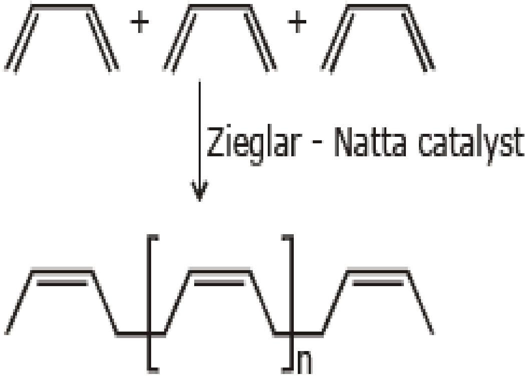
1:3 બ્યુટાડાઈનનું મુક્તમૂલક ક્રિયાવિધિ ની મદદથી બહુલીકરણ કરતાં પોલિ 1:3 બ્યુટાડાઈન પ્રાપ્ત થાય છે. આ પ્રક્રિયા 1:4 સંયોજન દ્વારા થાય છે.

$$Rad\cdot + n\ CH_2{=}CH{-}CH{=}CH_2 \xrightarrow{Poly^n}$$
1:3 બ્યુટાડાઈન

$$Rad{-}CH_2{-}CH{=}CH{-}CH_2{-}CH_2{-}CH{=}CH{-}CH_2{-}CH_2{-}CH{=}CH{-}CH_2\sim\sim$$

$$\downarrow$$

$$[-CH_2{-}CH{=}CH{-}CH_2-]_n$$
પોલિ 1.3 બ્યુટાડાઈન



cis poly (1,3 butadiene)

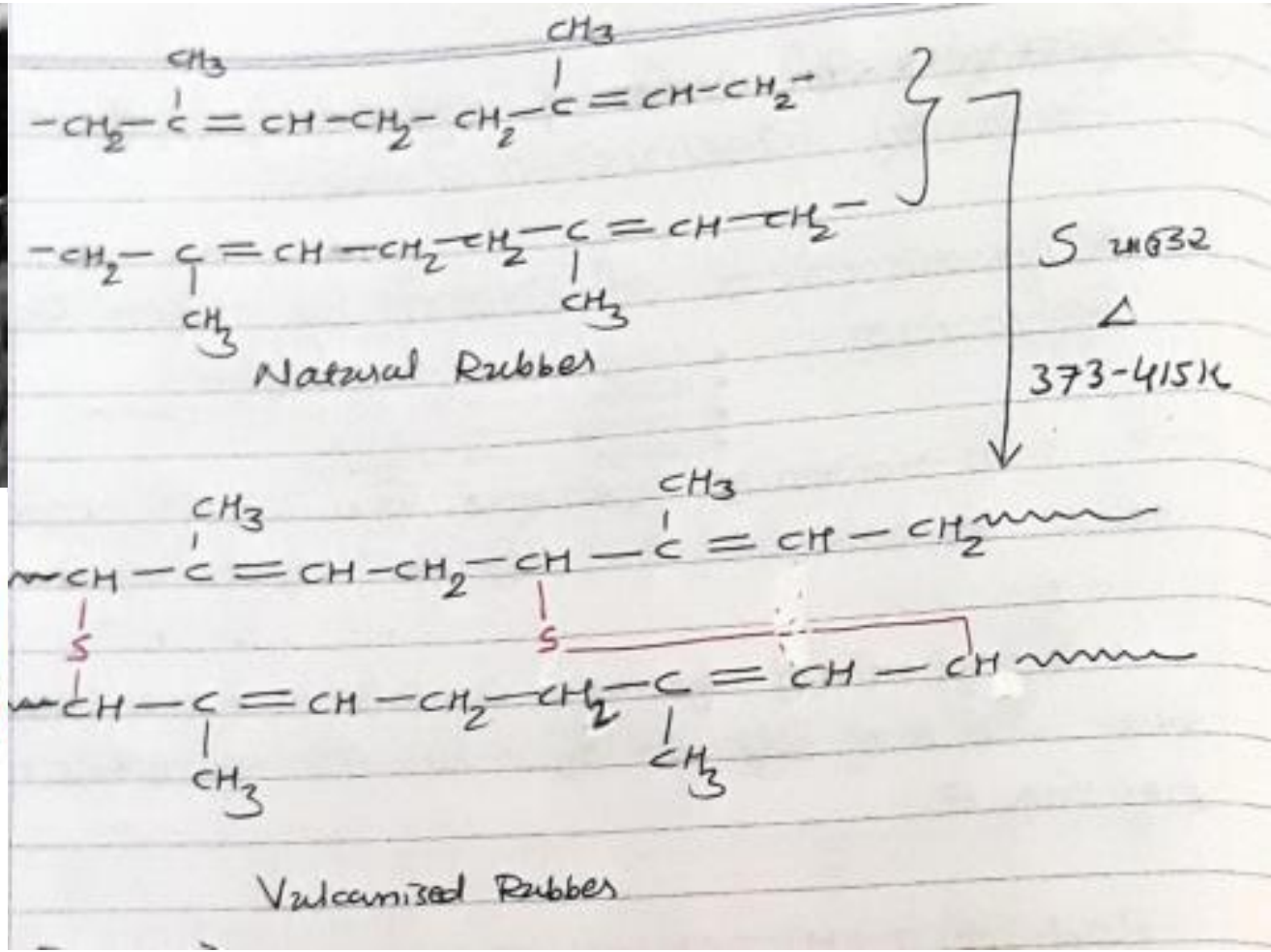
* Naturally Rubber :

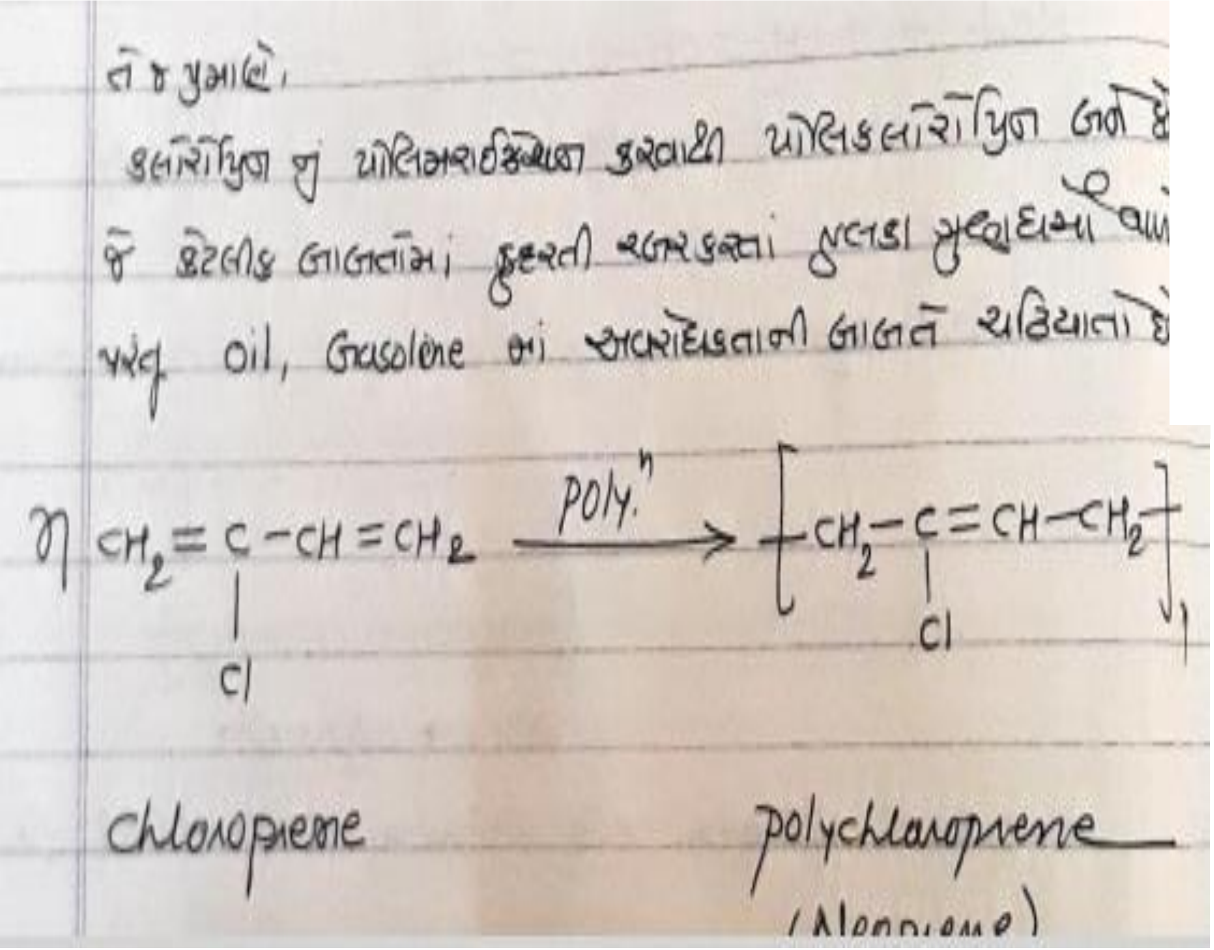
$$n\ CH_2=\underset{\displaystyle CH_3}{\overset{\displaystyle |}{C}}-CH=CH_2 \xrightarrow{\text{Poly}} \left[CH_2-\underset{\displaystyle CH_3}{\overset{\displaystyle |}{C}}=CH-CH_2\right]_n$$

આઇસોપ્રિન Cis- પોલી આઇસોપ્રિન (Naturally Rubber)

→ કુદરતી રબરને "S" સાથે (373 - 415K) ગરમ કરતા કુદરતી રબર ની બે શૃંખલા વચ્ચે "S" bridge બનાવે છે પરિણામે રબર સારુ કે મજબૂત બને છે. આ પદ્ધતિને Vulcanisation કહે છે & આ રબરને Vulcanised Rubber કહે છે.


ORIGINALS


S 2MBS2
373-415K
Natural Rubber
Vulcanised Rubber



તે જ પ્રમાણે,
ક્લોરોપ્રિન નું પોલિમરાઈઝેશન કરવાથી પોલિક્લોરોપ્રિન બને છે
જે કેટલીક બાબતોમાં કુદરતી રબર કરતાં નબળા ગુણધર્મો ધરાવે
પરંતુ oil, Gasoline માં અવરોધકતાની બાબતે ચઢિયાતો છે

$$n\, CH_2=\underset{\displaystyle Cl}{\underset{|}{C}}-CH=CH_2 \xrightarrow{\text{poly}^n} \left[-CH_2-\underset{\displaystyle Cl}{\underset{|}{C}}=CH-CH_2-\right]_n$$

Chloroprene — polychloroprene (Neoprene)

Electrophilic Addition in Conjugated Diene or 1:4 Addition

1:4 Addition in Conjugated Diene :

કોન્જ્યુગેટેડ ડાઈન (એકાંતરિક દ્વિબંધ ધરાવતાં) માં ઇ-અનુરાગી યોગશીલન OR 1:4 યોગશીલન :

એકાંતરિત દ્વિબંધ ધરાવતાં ડાઈનની BB_2 સાથે યોગશીલ પ્રક્રિયા કરતાં 1 & 4 ના સ્થાને આવેલા દ્વિબંધ આગળ જ BH_2 ક્રમશઃ ઉમેરાય છે & નીચે મુજબ ઇલેક્ટ્રોફિલિક આલ્કેન બને છે. આ પ્રક્રિયાને 1:4 યોગશીલન પ્રક્રિયા કહે છે.

E-9.

(2) $CH_2=CH-CH_2-CH=CH_2 \xrightarrow{Br_2}$ $CH_2(Br)-CH(Br)-CH_2-CH=CH_2$

1 : 4 [illegible] પ્રક્રિયા

1 : 2 સ્થાનમાં પ્રક્રિયા

$\downarrow Br_2$

$CH_2(Br)-CH(Br)-CH_2-CH(Br)-CH_2(Br)$

1, 2, 4, 5 સ્થાનમાં પ્રક્રિયા

તે પ્રમાણે,

(1) $CH_2=CH-CH=CH_2 \xrightarrow[\text{[illegible]}]{Br_2}$ $CH_2(Br)-CH(Br)-CH=CH_2$ &

1 : 3 બ્યુટાડાઈન

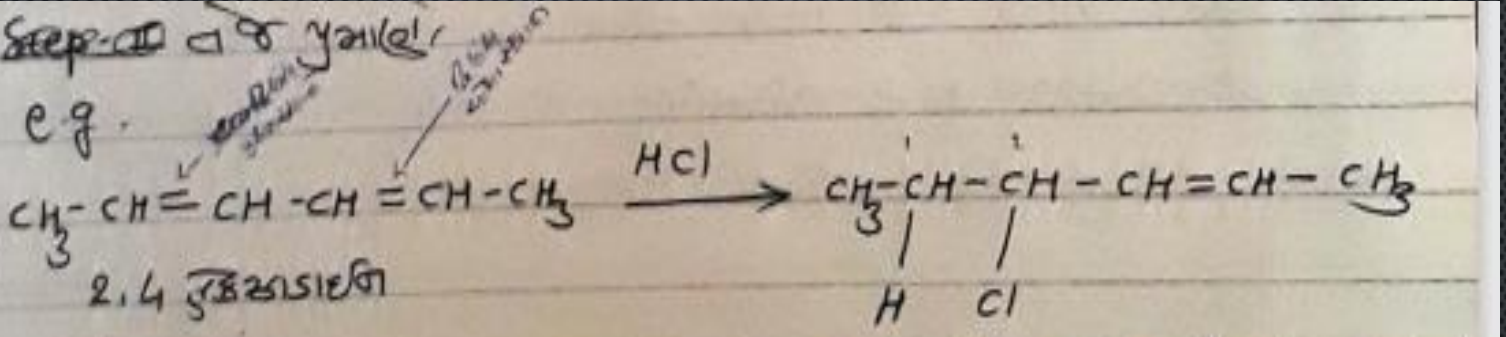
1, 2 સ્થાનમાં બ્યુટીન (1 : 2 સ્થાનમાંક)

$CH_2(Br)-CH=CH-CH_2(Br)$

1, 4 સ્થાનમાં 2-બ્યુટીન (1 : 4 સ્થાનમાંક)

Step-III चे उदाहरण :

e.g.



2,4 हेक्साडाइन

4-क्लोरो, 2 हेक्सीन (1:2 नाथर)

+

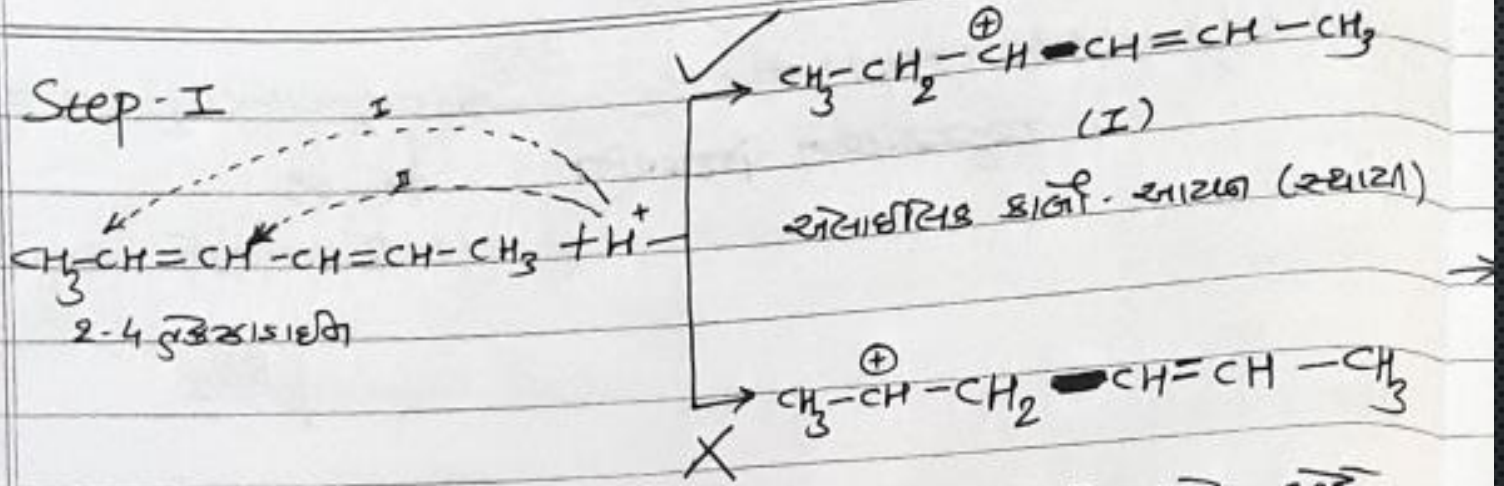
3-क्लोरो, 3- हेक्सीन (1:4 नाथर)

e.g. (3)

(13)

Mechanism: પ્રક્રિયાવિધિ :

Step - I

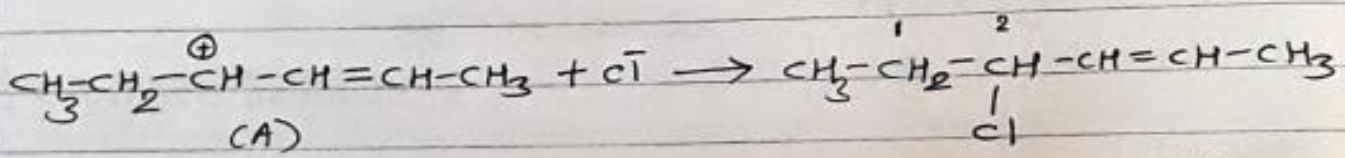


આમ પ્રથમ તબક્કામાં કાર્બોધ્રુવોનું કાર્બનમાં ગમે તે એક દ્વારા ચોગાશીલ પ્રક્રિયા થાય છે & સ્થાયી એલાઈલિક કાર્બો. આયન બને છે. અહીં કાર્બો. આયન (I) ના બે સ્વરૂપો દોરાય છે.

$CH_3-CH_2-\overset{\oplus}{C}H-CH=CH-CH_3$ & $CH_3-CH_2-CH=CH-\overset{\oplus}{C}H-CH_3$

(A) (B)

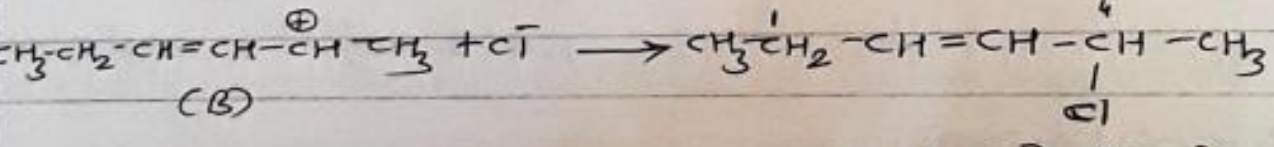
Step - II



(A)

(1 : 2 યોગશલ્ય)

+

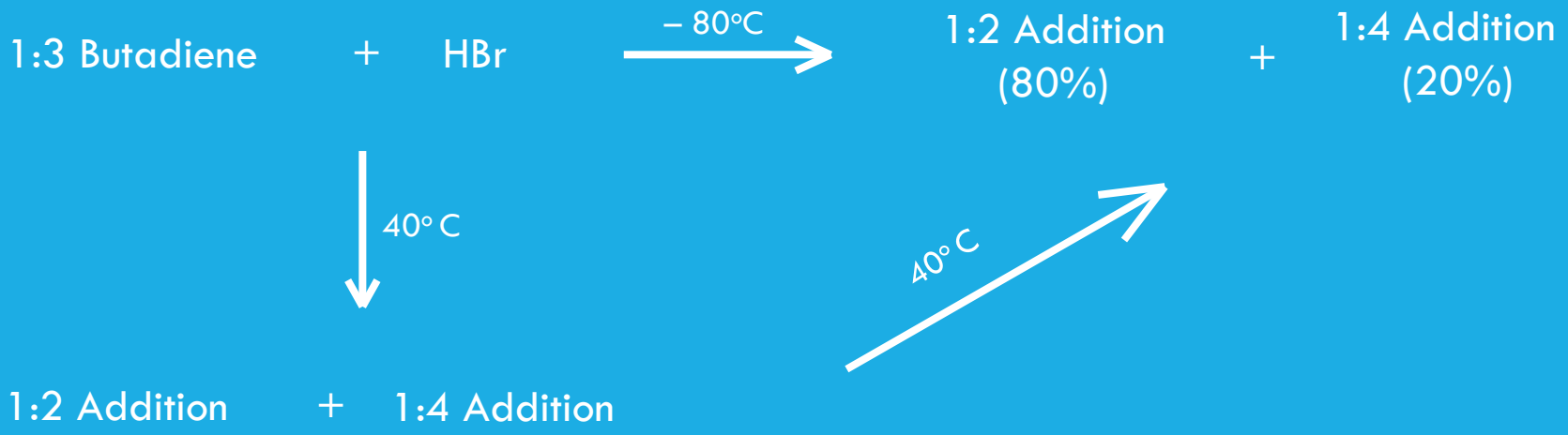


(B)

(1 : 4 યોગશલ્ય)

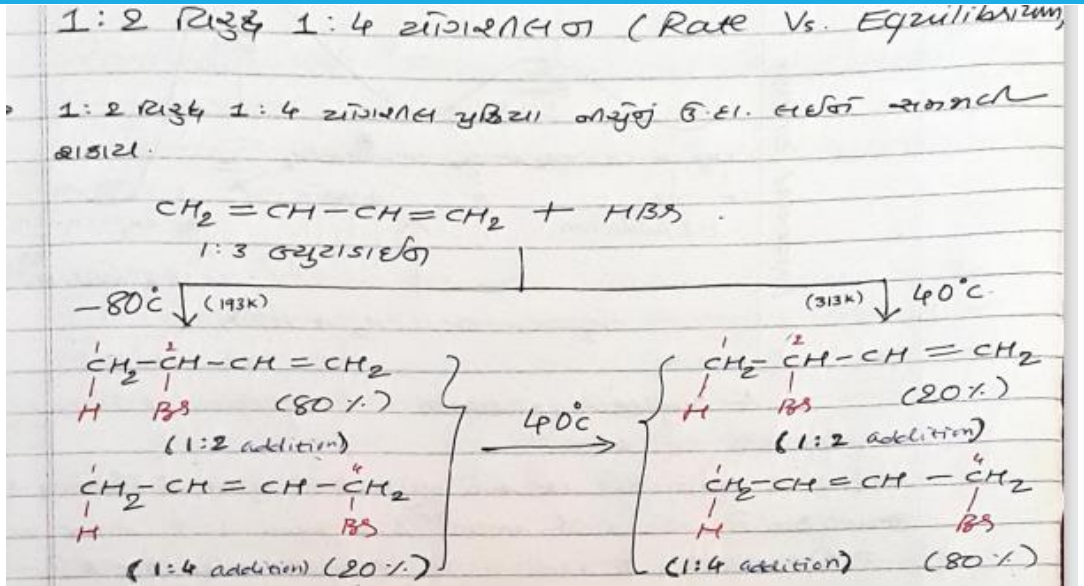
દ્વિતીય તબક્કામાં કાર્બો-ધાયન (A) & (B) ની Cl^- સાથે પ્રક્રિયા થતાં 1 : 2 કે 1 : 4 યોગશલ્ય પ્રક્રિયા થાય છે & જ્યારે 1 : 2 યોગશલ્ય કે 1 : 4 યોગશલ્ય નીપજ મળે છે

1:2 Vs 1:4 Addition or Rate Vs Equilibrium



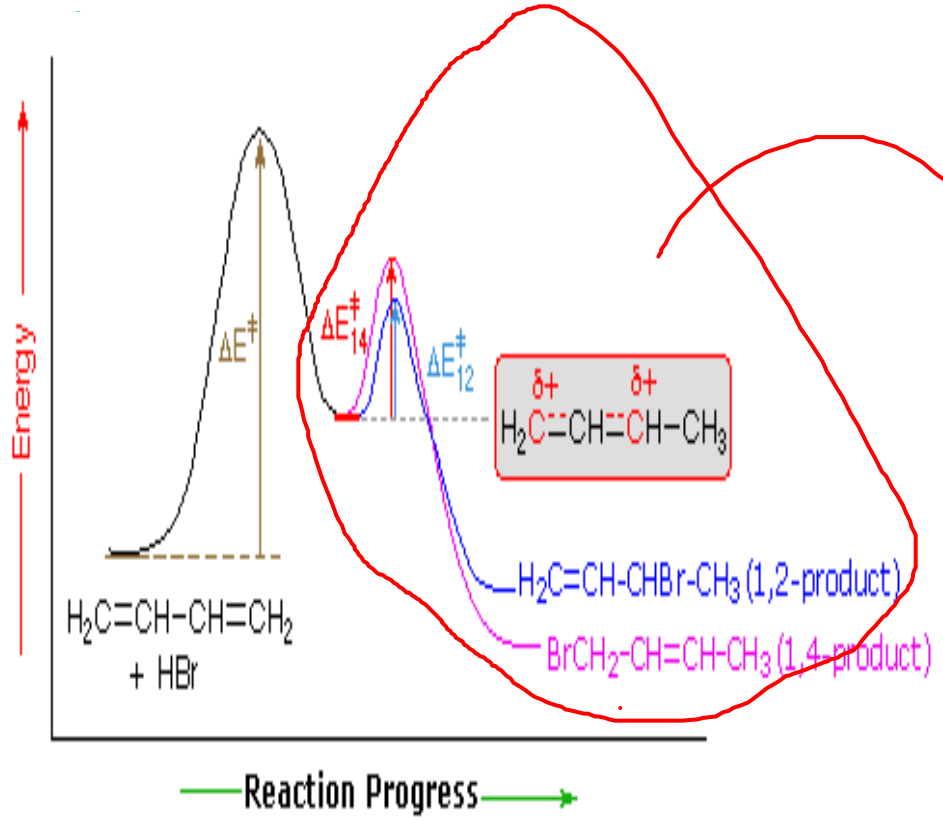
1:2 વિરુદ્ધ 1:4 યોગશ્રમલક્ષ (Rate Vs. Equilibrium)

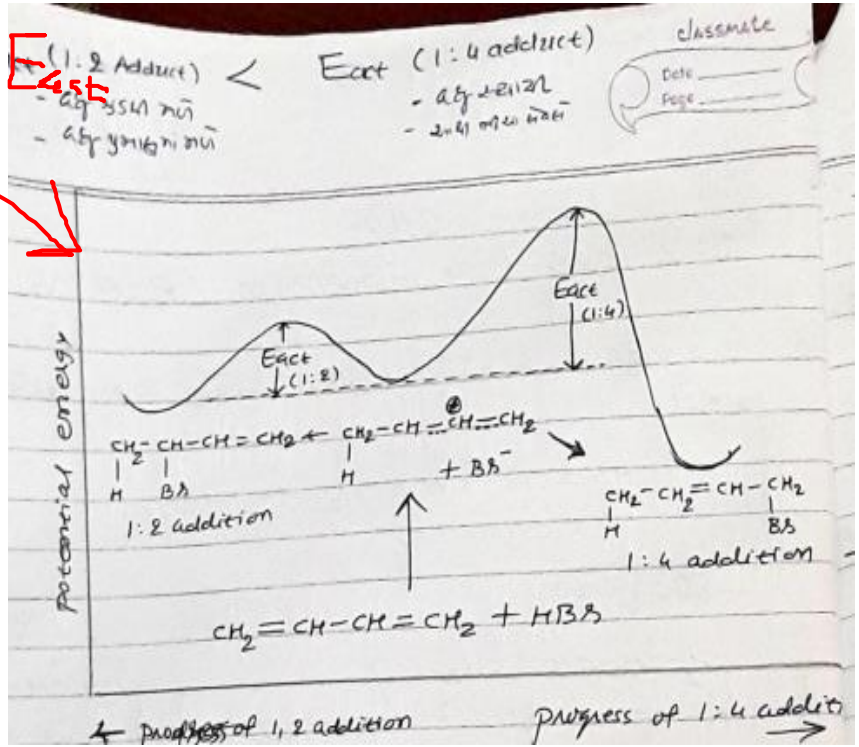
1:2 વિરુદ્ધ 1:4 યોગશ્રમલ પ્રક્રિયા નીચેનું ઉ.દા. લઈને સમજીએ



→ ઉપર દર્શાવ્યા મુજબ 1:3 બ્યુટાડાઈન ની HBr સાથે −80°C તાપમાને પ્રક્રિયા કરવાથી 80% 1:2 & 20% 1:4 નીપજ મળે છે જ્યારે 40°C તાપમાને પ્રક્રિયા કરવાથી 20% 1:2 & 80% 1:4 નીપજ મળે છે. આ નીપજો તાપમાન પર આધારિત છે. આથી તેમની વચ્ચે ઉષ્મીય સંતુલન સ્થાપાયેલું હોય છે. આથી વાસ્તવમાં સંતુલન મિશ્રણમાં 1:4 નીપજ નું પ્રમાણ વધારે હોય છે.

→ આથી −80°C તાપમાને 1:4 કરતાં 1:2 નીપજ વધુ પ્રમાણમાં મળે છે. અર્થાત 1:4 કરતાં 1:2 નીપજ ઝડપથી બને છે. તાપમાન વધારતાં આ મિશ્રણ નું સંતુલન મિશ્રણમાં ફેરવાય છે. આમ


Energy
$\Delta E^{\ddagger}$
$\Delta E^{\ddagger}_{14}$
$\Delta E^{\ddagger}_{12}$
δ+ δ+
$H_2C{=}CH{=}CH{-}CH_3$
$H_2C{=}CH{-}CH{=}CH_2$
+ HBr
$H_2C{=}CH{-}CHBr{-}CH_3$ (1,2-product)
$BrCH_2{-}CH{=}CH{-}CH_3$ (1,4-product)
Reaction Progress

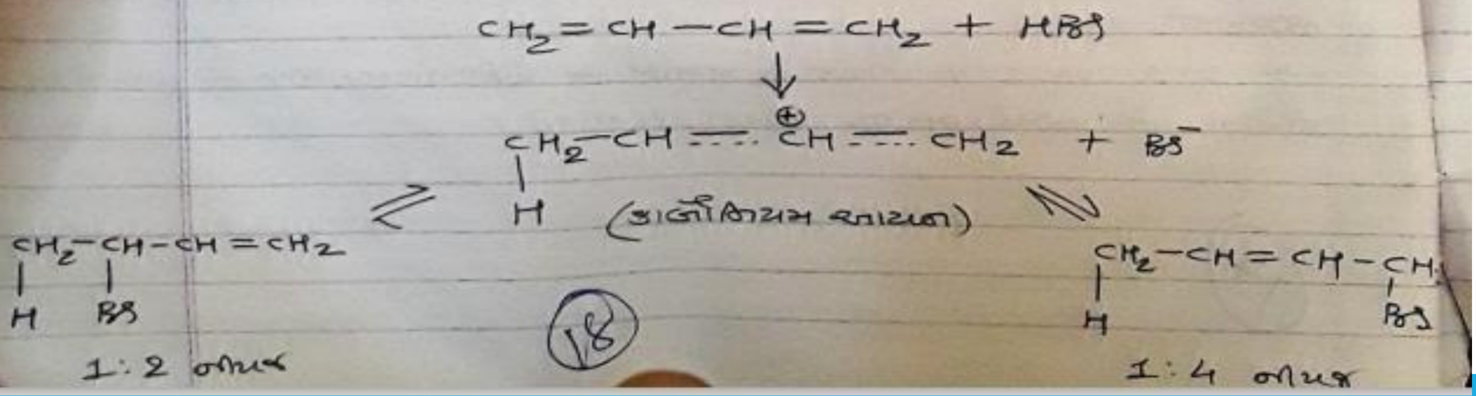

Eact (1:2 adduct) < Eact (1:4 adduct)
Potential energy
Eact (1:2)
Eact (1:4)
1:2 addition
1:4 addition
+ Br^-
$CH_2{=}CH{-}CH{=}CH_2 + HBr$
Progress of 1:2 addition
Progress of 1:4 addition

આલેખન પરથી કહી શકાય કે,

અહીં 1:3 બ્યુટાડાઇનની HBr સાથે પ્રક્રિયા થતાં પ્રથમ કાર્બોનિયમ આયન ઉત્પન્ન થાય છે. આ કાર્બો. આયન માંથી 1:4 કરતાં 1:2 નીપજ ઝડપી મળે છે. કારણ 1:4 કરતાં 1:2 નીપજની સક્રિયકરણ શક્તિ ઓછી જોઈએ છે. આમ હોવાં છતાં 1:2 નીપજ કરતાં 1:4 નીપજ વધુ સ્થાયી છે. કારણ તેનો ઓછા ઊર્જા લેવલ દર્શાવેલ છે.

ઉપર દર્શાવ્યા મુજબ 1:2 & 1:4 નીપજો (એલાઈલ હેલાઈડ) સરળતાથી આયનીકરણ પામી સમાન કાર્બો. આયન ઉત્પન્ન કરે છે. અને 1:2 તથા 1:4 નીપજ આ કાર્બો. આયન દ્વારા સંતુલન સ્થિતિ પ્રાપ્ત કરે

✓ અહીં 1:2 નીપજ ઝડપથી બને છે & ઝડપથી આયનીકરણ છે. જ્યારે 1:4 નીપજ ધીમેથી બને છે & ધીમેથી આયનીકરણ પામે છે. આમ ઊંચા T વધુ સ્થાયી (1:4) નીપજ મળે અર્થાત્ 1:2 નીપજ એ 1:4 નીપજ કરતાં ઝડપથી બને છે.



Free Radical Addition in Conjugated Diene

Peroxide → Rad •

Rad• + Br – CCl_3 → Rad – Br + • CCl_3

1:3 Butadiene + • CCl_3 → 1° Free radical + 2° Free radical

1° Free radical → Allylic Free Radical (stable)

Allylic Free Radical → (1:2 OR 1:4) Br·CCl_3 → 1:2 Adduct + 1:4 Adduct

Syn and Anti Addition Reactions :

https://www.youtube.com/hashtag/anti_products
https://www.youtube.com/watch?v=EbLLEbt9
https://youtu.be/EbLLEbt96Cs6Cs

Stereo Selective and Stereo Specific Reactions :

https://youtu.be/wVAQ-HGf4vI

https://youtu.be/rAKjN99FlhU

https://youtu.be/VCIr6T2NhLo

Free Radical Addition Reaction of 3-hexene with $BrBr_2$:

(i) Initiation : यहाँ :

$$BrBr_2 \xrightarrow{hv} Br\cdot + Br\cdot$$

(ii) Propagation : यहाँ :

$CH_3-CH_2-CH=CH-CH_2-CH_3 + Br\cdot \longrightarrow$

$CH_3-CH_2-\underset{\underset{Br}{|}}{CH}-\dot{C}H-CH_2-CH_3$

New free radical

$CH_3-CH_2-\underset{\underset{Br}{|}}{CH}-\dot{C}H-CH_2-CH_3 + BrBr_2 \longrightarrow$

$Br\cdot + CH_3-CH_2-\underset{\underset{Br}{|}}{CH}-\underset{\underset{Br}{|}}{CH}-CH_2-CH_3$

3, 4 dibromo hexane

(iii) Termination : यहाँ :

$Br\cdot + Br\cdot \longrightarrow BrBr_2$

$CH_3-CH_2-\underset{\underset{Br}{|}}{CH}-\dot{C}H-CH_2-CH_3 + Br\cdot \longrightarrow$

$CH_3-CH_2-\underset{\underset{Br}{|}}{CH}-\underset{\underset{Br}{|}}{CH}-CH_2-CH_3$

$CH_3-CH=CH_2 + Cl_2 \xrightarrow{>300^\circ c}$ ....

1-Propene

(i) Initiation :

$Cl-Cl \xrightarrow{>300^\circ c} \dot{C}l + \dot{C}l$

(ii) Propagation :

$Cl\cdot + CH_3-CH=CH_2 \rightarrow [CH_2=CH-\dot{C}H_2 \leftrightarrow \dot{C}H_2-CH=CH_2]$ + HCl

Allyl free radical

(iii) Termination :

$CH_2=CH-\dot{C}H_2 + Cl-Cl \rightarrow CH_2=CH-CH_2-Cl + Cl\cdot$

Allyl chloride

→ ઊંચા તાપમાને પ્રોપિનની Cl_2 સાથેની પ્રક્રિયા થી એલાઈલ ક્લોરાઈડ બને છે. આ પ્રક્રિયા addition નહિ પરંતુ - substitution પ્રકારની છે.

→ આ પ્રક્રિયામાં π બંધ ધરાવતા પ્રોપિનમાં Cl ઉમેરાય છે & ત્યારબાદ પ્રતિવર્તી રીતે દૂર પણ થઈ જાય છે. આથી π બંધને કોઈ અસર થતી નથી તે આથી જ વિલોપન નહીં પરંતુ વિસ્થાપન પ્રક્રિયા દ્વારા ___ એલાઈલ ક્લોરાઈડ નીપજ તરીકે મળે છે.

- પુરક્રિયા પૂર્ણ કરો. Complete the Reactions :

(1) $CH_2=CH-CH_3 \xrightarrow{NBS}$ ------

Ans : $CH_2=CH-CH_3 \xrightarrow{NBS} CH_2=CH-CH_2-Br$

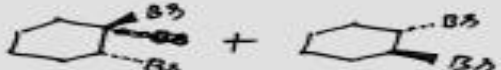
3-Bromo, 1-propene

(2)  $\xrightarrow[CCl_4]{NBS}$ ------

Ans:  $\xrightarrow[CCl_4]{NBS}$ 

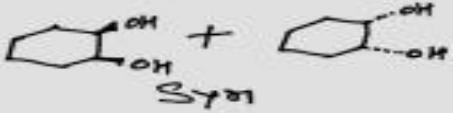
3- Bromo Cyclo hexene

(3)  $\xrightarrow{Br_2}$ -------

Ans:  $\xrightarrow{Br_2}$ 

Anti

(4)  $\xrightarrow[H_2O_2]{KMnO_4}$ ------

 $\xrightarrow[H_2O_2]{KMnO_4}$ 

Syn

Short Summary of the Course :

UNIT : 1

Electrophilic & Free Radical Addition Reactions :

@ Electrophile & examples @ Free Radical & examples @ Homolytic fission @ Heterolytic fission
@ Addition reaction @ Markonikov's rule @ Anti Markonikov's rule
@ Syn and Anti @ Stereo selective & Stereo specific reaction
@ Chiral "C" d, l, D, L, Racemic mix. @ Optical isomer @ Geometrical isomer @ Enantiomer @ Meso compound
@ Diene and Conjugated Diene @ Polymerisation reaction

UNIT : 2

Active Methylene Group Compounds:

@ Active methylene group @ Compounds having active methylene group @ Keto enol tautomerism @ Condensation reactions with examples

UNIT : 3

Nucleophilic Aromatic Substitution Reactions :

@ Nucleophile & examples @ Substitution reactions & examples @ Nucleophilic Aromatic Substitution & examples
@ SN1 & SN2 reactions @ Induced effect @ Resonance effect @ Addition reaction @ Benzyne

Formula For Grand Success in the Examinations

1. Positive Attitude towards Education
2. Confident on yourself & Know yourself
3. Perfect Planning
4. Time Management

↓

GRAND SUCCESS

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THANK
YOU!