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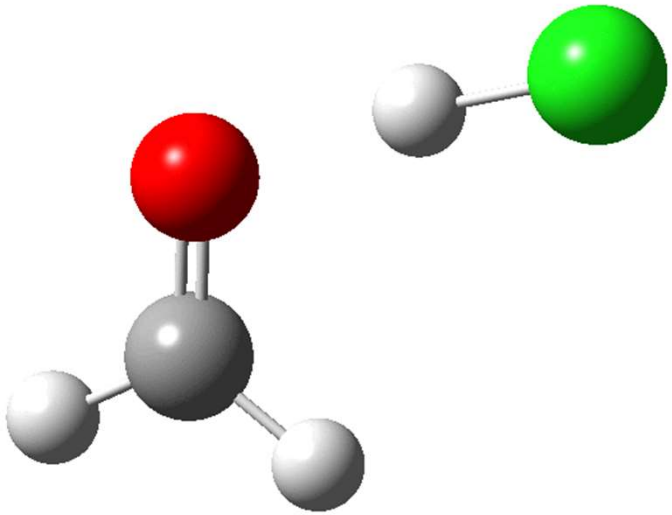
Electrophilic & Free Radical Addition Reaction

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



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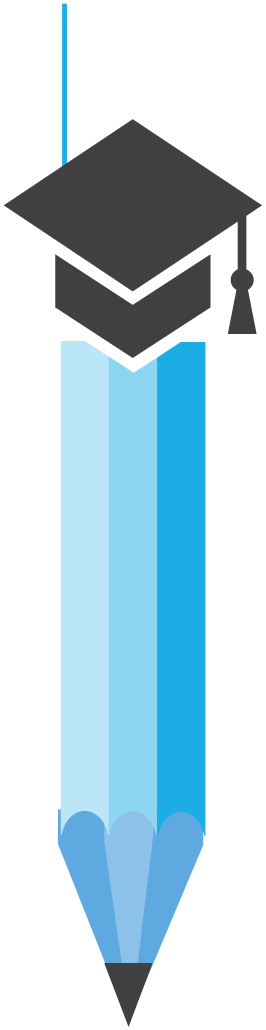


SYLLABUS

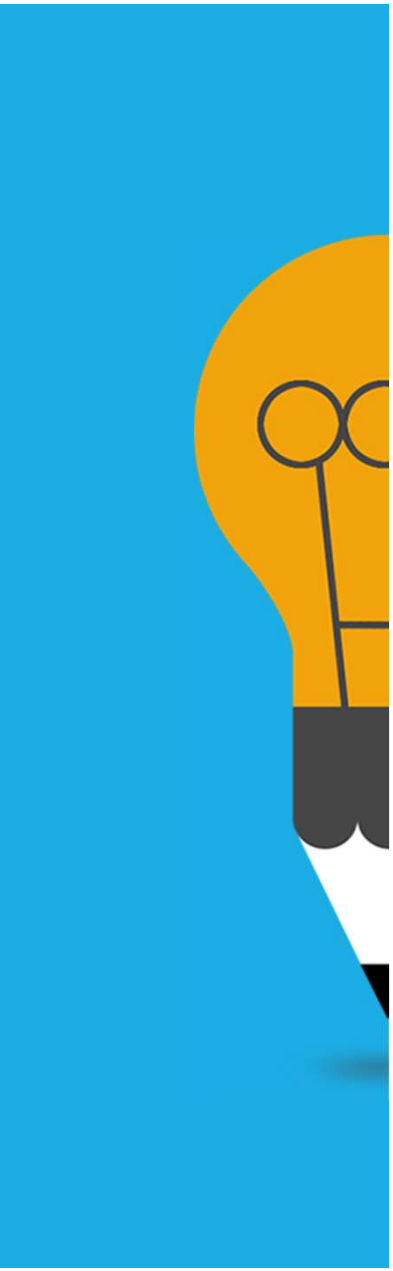
- Addition to carbon – carbon double bond
- Markonikovs rule
- Electrophilic addition, orientation, reactivity
- Reaarangement, Dimerization, Alkylation
- Peroxode effect (Anti-markonikov)
- Free radical addition, Mechanism of peroxide initiated addition of HB r
- Syn and anti addition mechanism for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

REFERENCE BOOKS

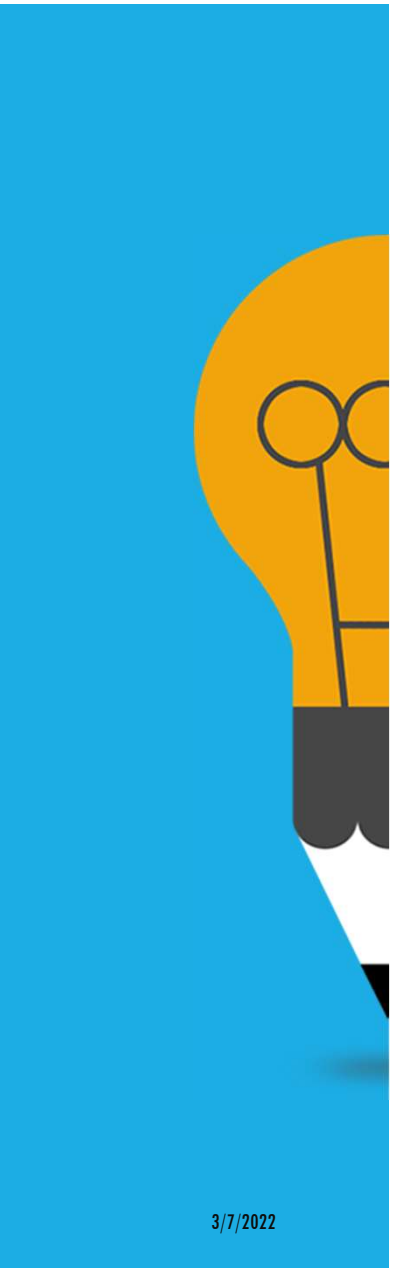
- Organic chemistry by morrisson & boyed : Vth edition
- Advanced organic chemistry by R.K.Bansal
- Organic chemistry by I.L.Finar volume I & II (Vth edition)
- Organic reaction & mechanism IInd edition by P.S.Kalsi
- Organic chemistry by S.M.Mukharjee, S.P.Singh, R.P.Kapoor

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. NO2+, Cl+, SO3H+ 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

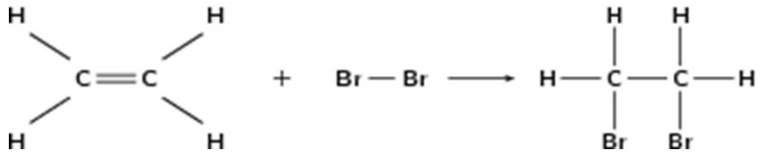
03

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

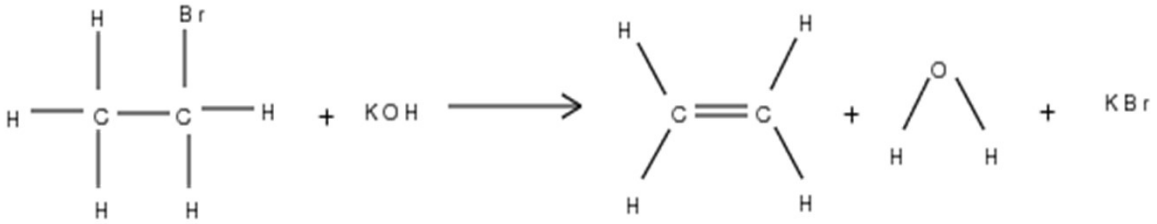
04

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

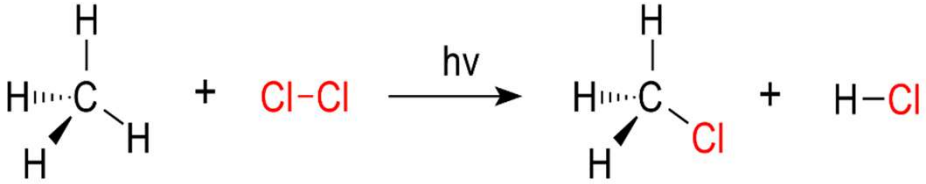
Addition Reaction



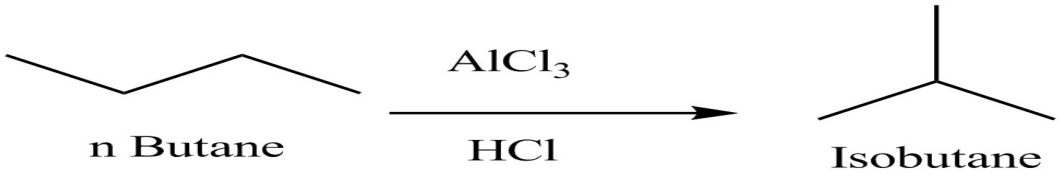
Elimination Reaction



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.

• સમયુક્તિઓની સામાન્યીકૃત 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) $CH_3-CH=CH_2 + Br_2 \xrightarrow{CCl_4} CH_3-\underset{Br}{CH}-CH_2Br$

1,2 dibromo propane

• અસમયુક્તિઓની સામાન્યીકૃત પ્રક્રિયાઓ :

(Con. H_2SO_4, H_2O, $Hg(OAc)_2$, BH_3, polymerisation)

(i) $CH_3-CH=CH_2 + H_2SO_4 \longrightarrow CH_3-\underset{OSO_3H}{CH}-CH_3$

(H^+ - OSO_3H^-)

Isopropyl hydrogen Sulphate

(ii) $CH_3-CH=CH_2 + H_2O \xrightarrow{H^+} CH_3-\underset{OH}{CH}-CH_3$

(H^+-OH^-)

2-propanol

(3) Oxy-mercuration-Demercuration :

$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-CH=CH_2 + Hg(OAc)_2 \xrightarrow[-CH_3COOH]{H^+-OH^-} H_3C-\underset{CH_3}{\overset{CH_3}{C}}-\underset{OH}{CH}-\underset{HgOAc}{CH_2}$

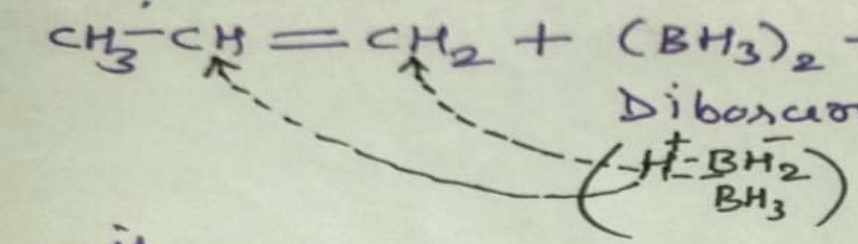
3,3 dimethyl 1-butene

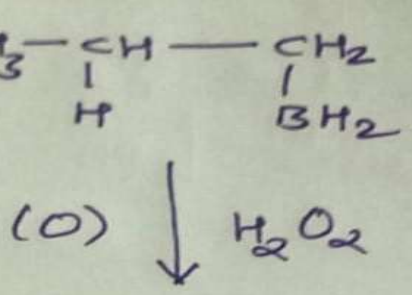
$\xrightarrow{NaBH_4}$

$Hg + CH_3COOH + CH_3-\underset{CH_3}{\overset{CH_3}{C}}-\underset{OH}{CH}-CH_3$

3,3 dimethyl, 2-butanol

(4) Hydroboration - Oxidation (Anti Markovnikov)





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

1-Propanol

(5) Polymerisation :

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

Ethene — Polythene

Markonikov's Rule

Markonikov's Rule

01 Rule

02 Examples

03 Mechanism

04 Other examples

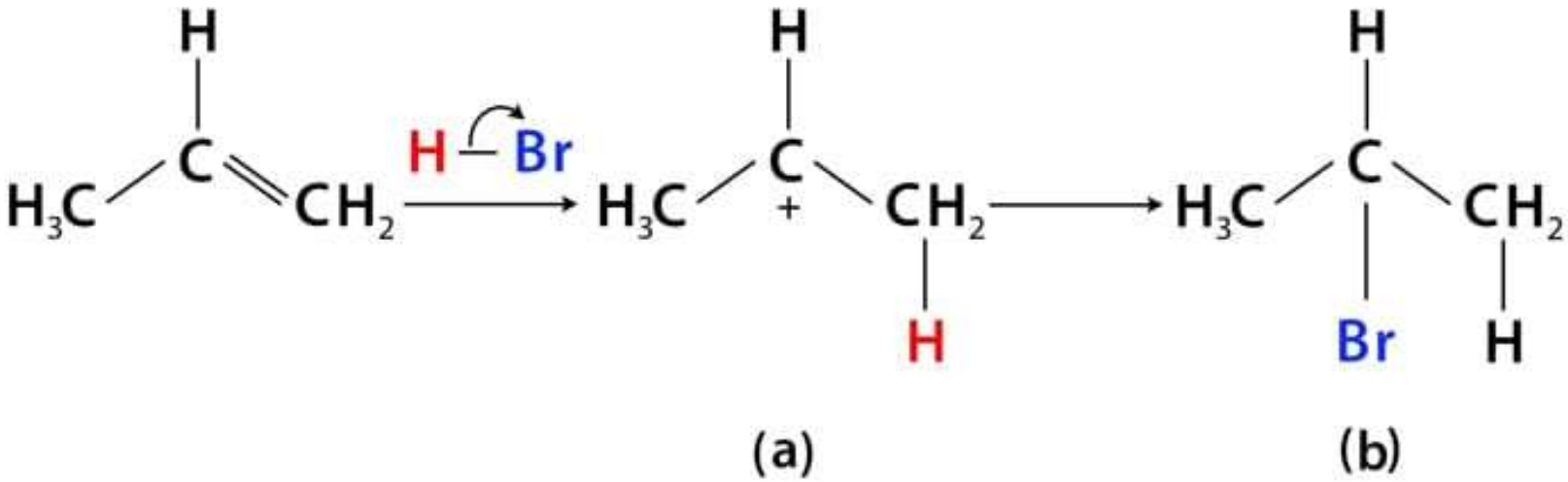
05 Potential energy diagram

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



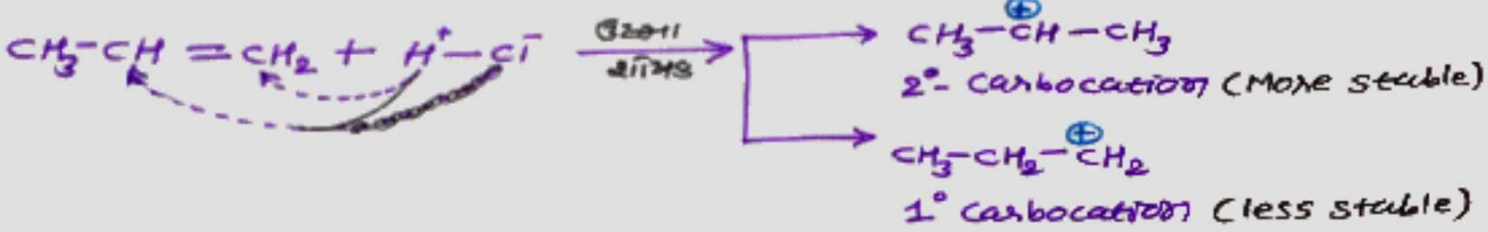
(a) •hydrogen (H) added to 1° carbon (C) for more stable carbocation

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

ChemistryLearner.com

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

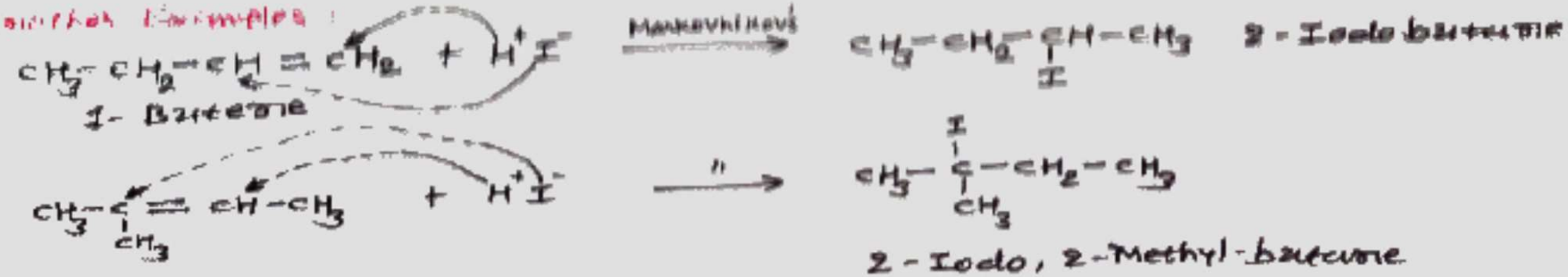
Step - I

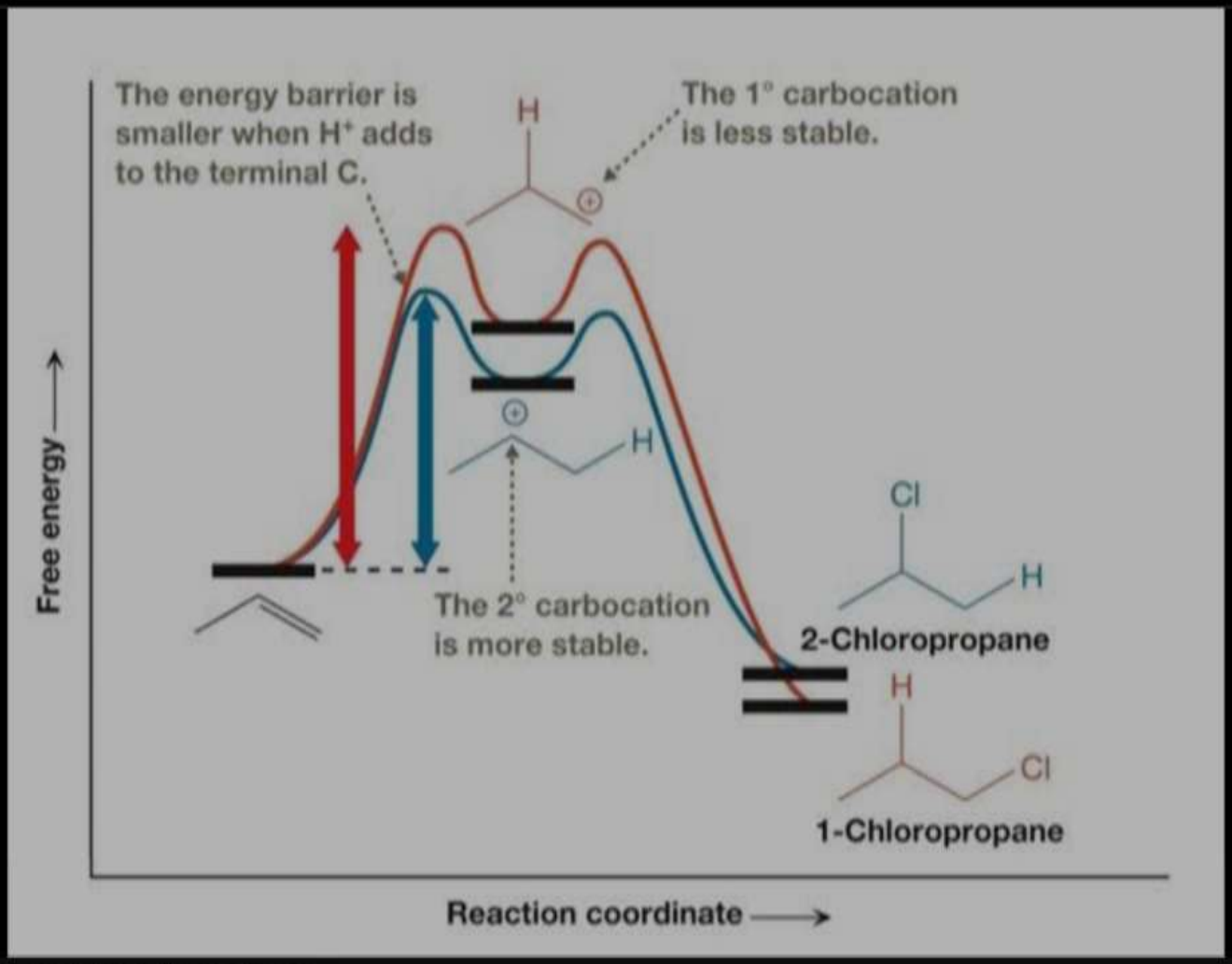


→ અહીં પ્રથમ તબક્કો ધીમો છે. આથી તે વેગ નિર્ણાયક તબક્કો છે. આ તબક્કા દરમિયાન 2° કાર્બોધન બને છે જેના માટે ΔG_2 નું મૂલ્ય ઓછું છે આથી તેમાંથી બીજા તબક્કામાં નીચા ઊર્જા અવરોધથી ઉત્પન્ન થાય છે. જ્યારે 1° કાર્બોધન માટે ΔG_1 નું મૂલ્ય વધુ છે આથી તે પ્રમાણમાં ઓછો રચાય છે.

Step - II

* Another Examples :





Anti Markonikov's Rule: (Free Radical Addition)

01 Rule

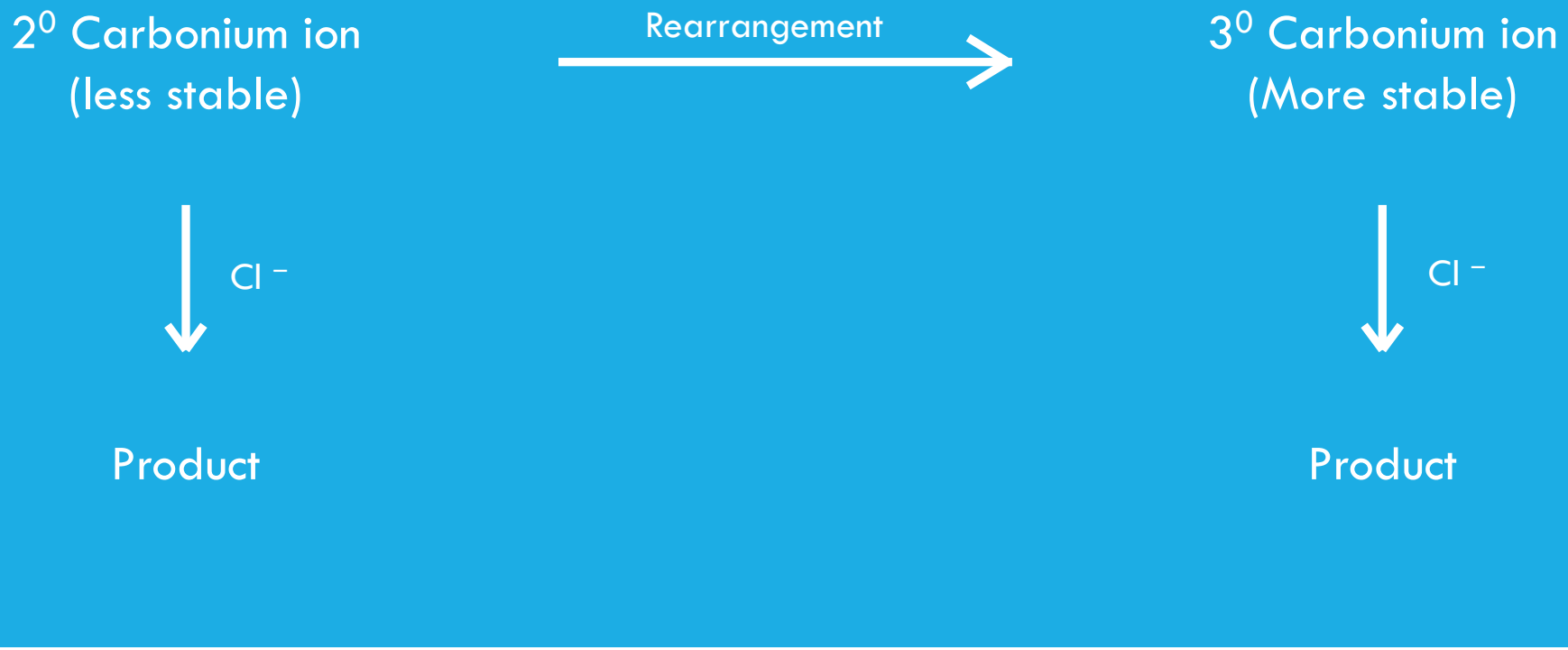
02 Examples

03 Mechanism

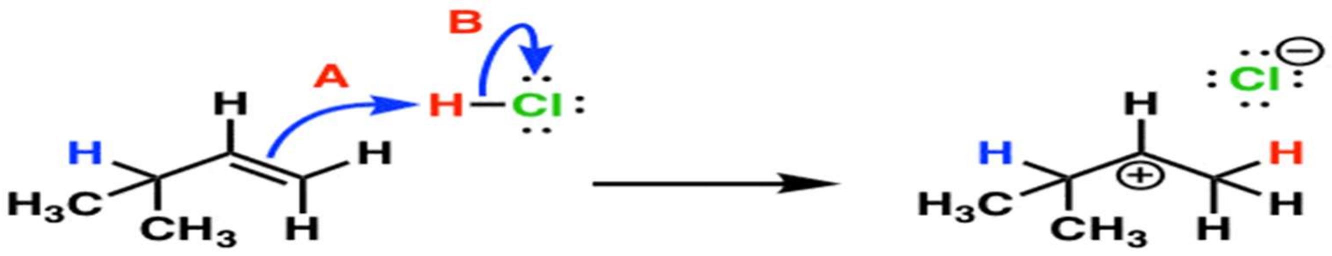
04 Other examples

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

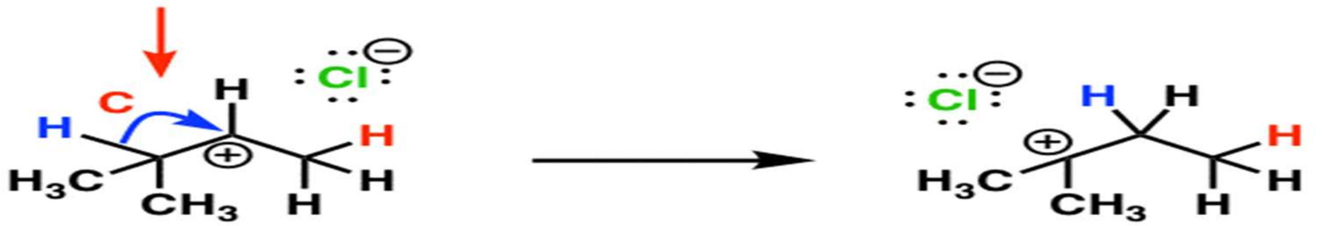
Observation: secondary carbocation

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"



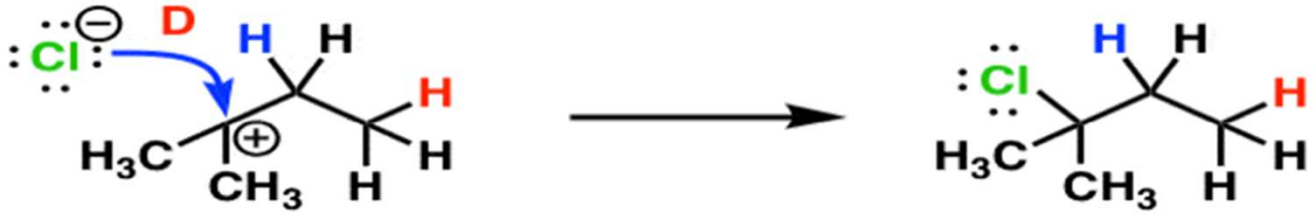
Form	Break
C_1–H	C_1–C_2 (π)
C C_2–H	**C** C_3–H
C_3–Cl	H–Cl

Secondary carbocation

Tertiary carbocation

a more stable carbocation

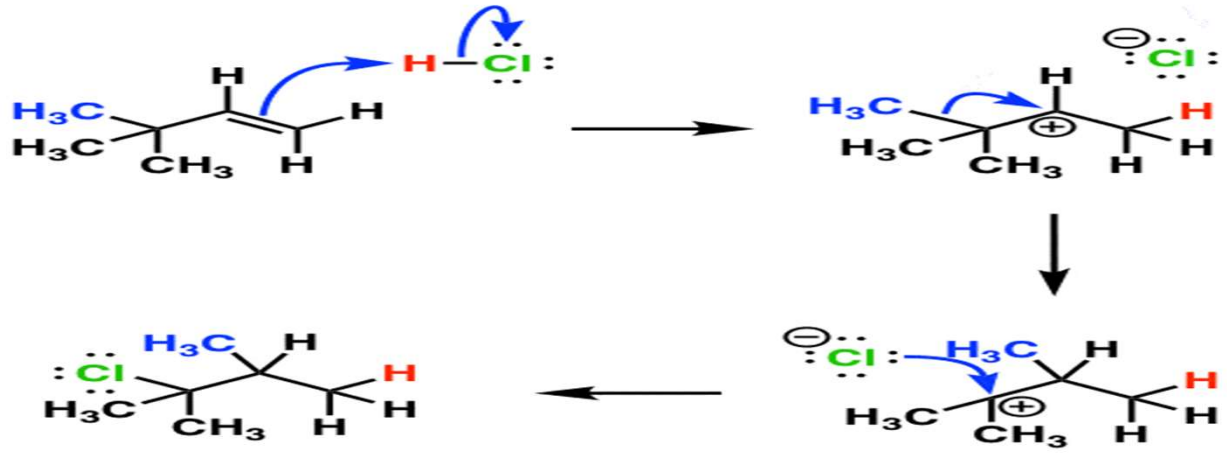
Step 3 - Attack of nucleophile (arrow D)



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

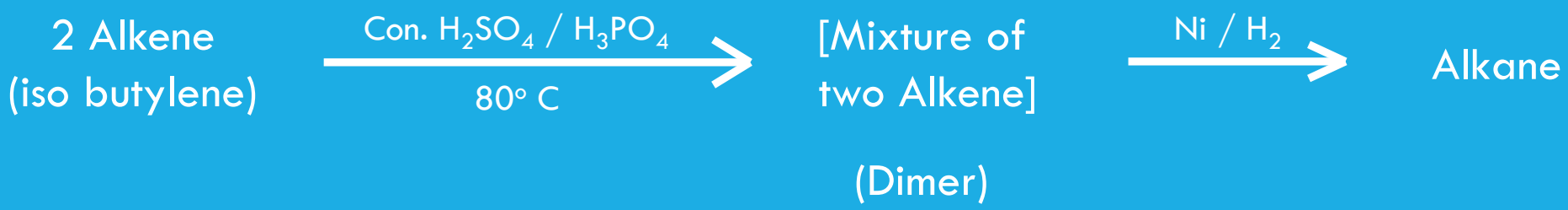
Tertiary carbocation

Alkyl shift example:



Electrophilic Addition : Dimerization

(Dimerization of Isobutylene)



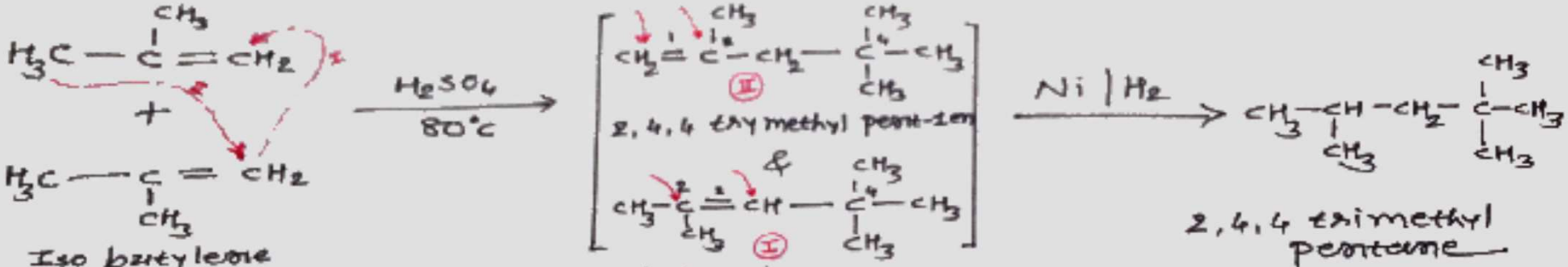
Isobutylene + H^+ → 3^0 Carbonium ion (less stable)

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

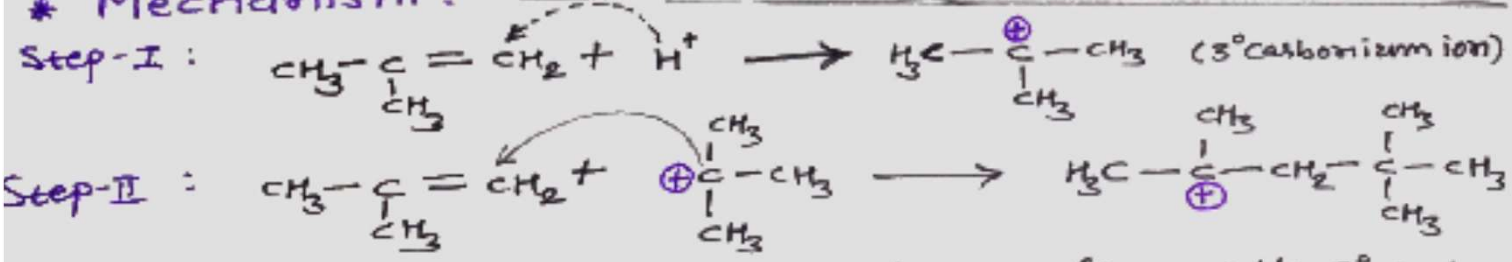
3^0 Carbonium ion $\xrightarrow{-H^+}$ 2,4,4 tri methyl 1-pentene & 2,4,4 tri methyl 2-pentene

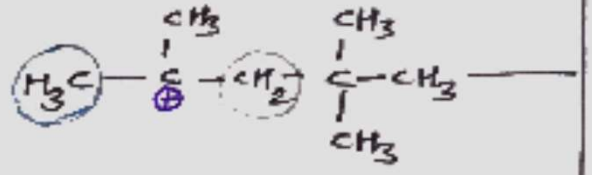
2,4,4 tri methyl 1-pentene & 2,4,4 tri methyl 2-pentene $\xrightarrow{Ni / H_2}$ 2,4,4 tri methyl pentane

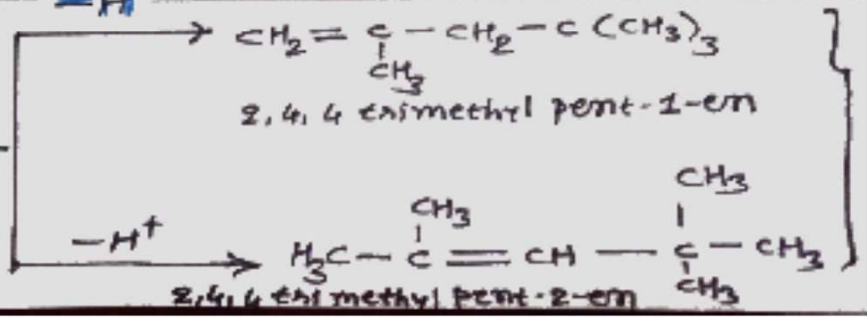
* Electrophilic Addition : Dimerisation : (Reaction)



* Mechanism :





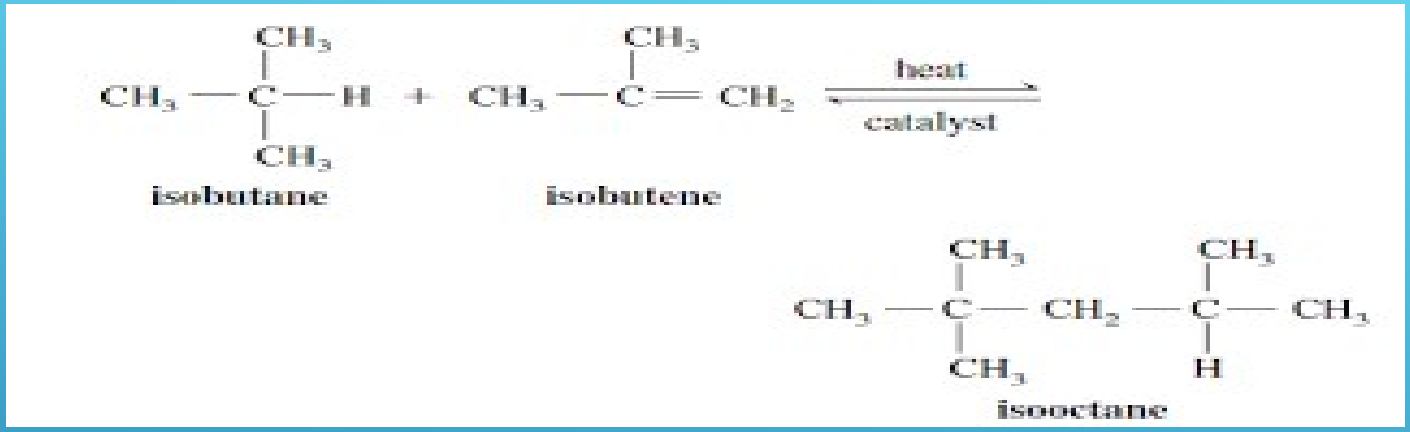


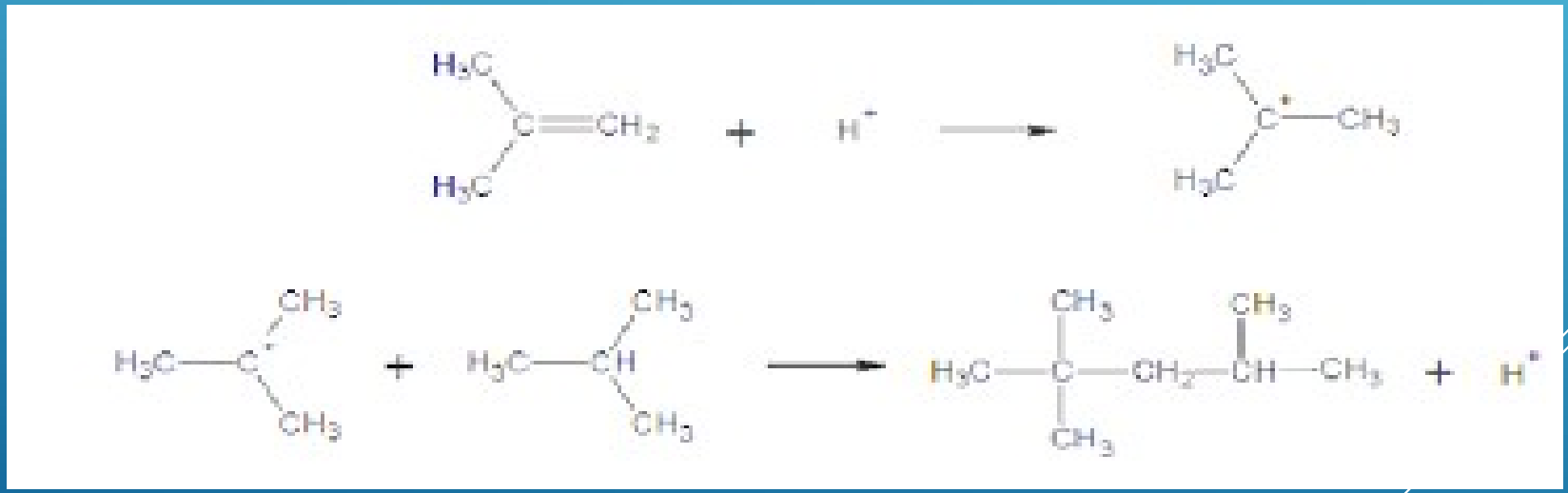
Electrophilic Addition : Alkylation

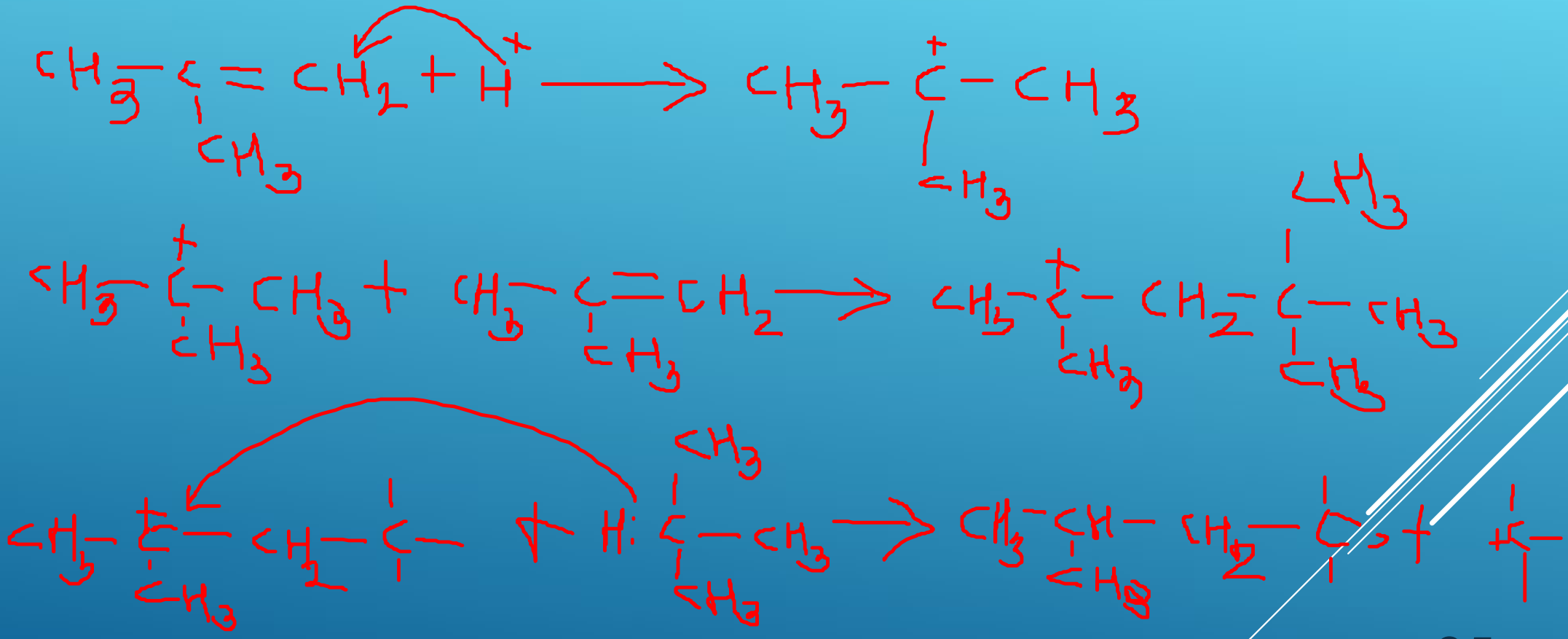
Isobutyline + H^+ ⟶ 3^0 Carbonium ion (less stable)

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

મુક્ત મૂલક રીતે ડાઈન નું ગુણધર્મ રબર તથા તેના વિસ્થાયકોની બનાવટ :

Polymerisation of Diem by Free Radical Reaction :

- 1:3 બ્યુટાડાઈન → પોલિ 1:3 બ્યુટાડાઈન
- બહુલીકરણ → cis પોલિ આઇસોપ્રિન (કુદરતરબર)
- કુદરતરબર → પાકે રબર
- ક્લોરોપ્રિન → પોલિક્લોરોપ્રિન

→ ડાઈન સંયોજનોનું મુક્ત મૂલક ક્રિયાવિધિ દ્વારા ગુણધર્મ રબર તથા તેના વ્યુત્પન્નો પ્રાપ્ત થાય છે.

e.g.

1:3 બ્યુટાડાઈન નું મુક્તમૂલક ક્રિયાવિધિ ની મદદ થી ગુણધર્મ કરતાં પોલિ 1:3 બ્યુટાડાઈન પ્રાપ્ત થાય છે. આ પ્રક્રિયા 1:4 થી થાય છે દ્વારા થાય છે.

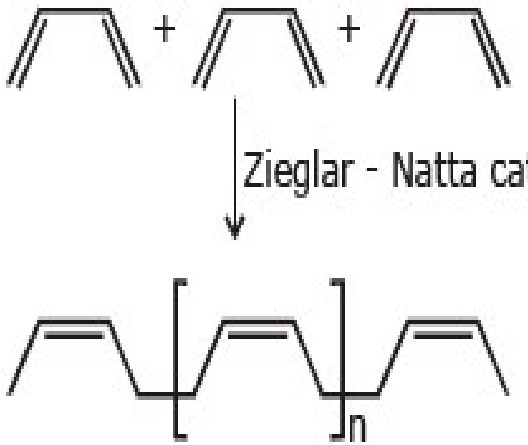
$$Rad\cdot + n\ CH_2=CH-CH=CH_2 \longrightarrow \text{Poly}^n$$

1:3 બ્યુટાડાઈન

$$Rad-CH_2-CH=CH-CH_2-CH_2-CH=CH-CH_2-CH_2-CH=CH-CH_2\cdots\cdots$$

$$\left[-CH_2-CH=CH-CH_2-\right]_n$$

પોલિ 1:3 બ્યુટાડાઈન



cis poly (1,3 butadiene)

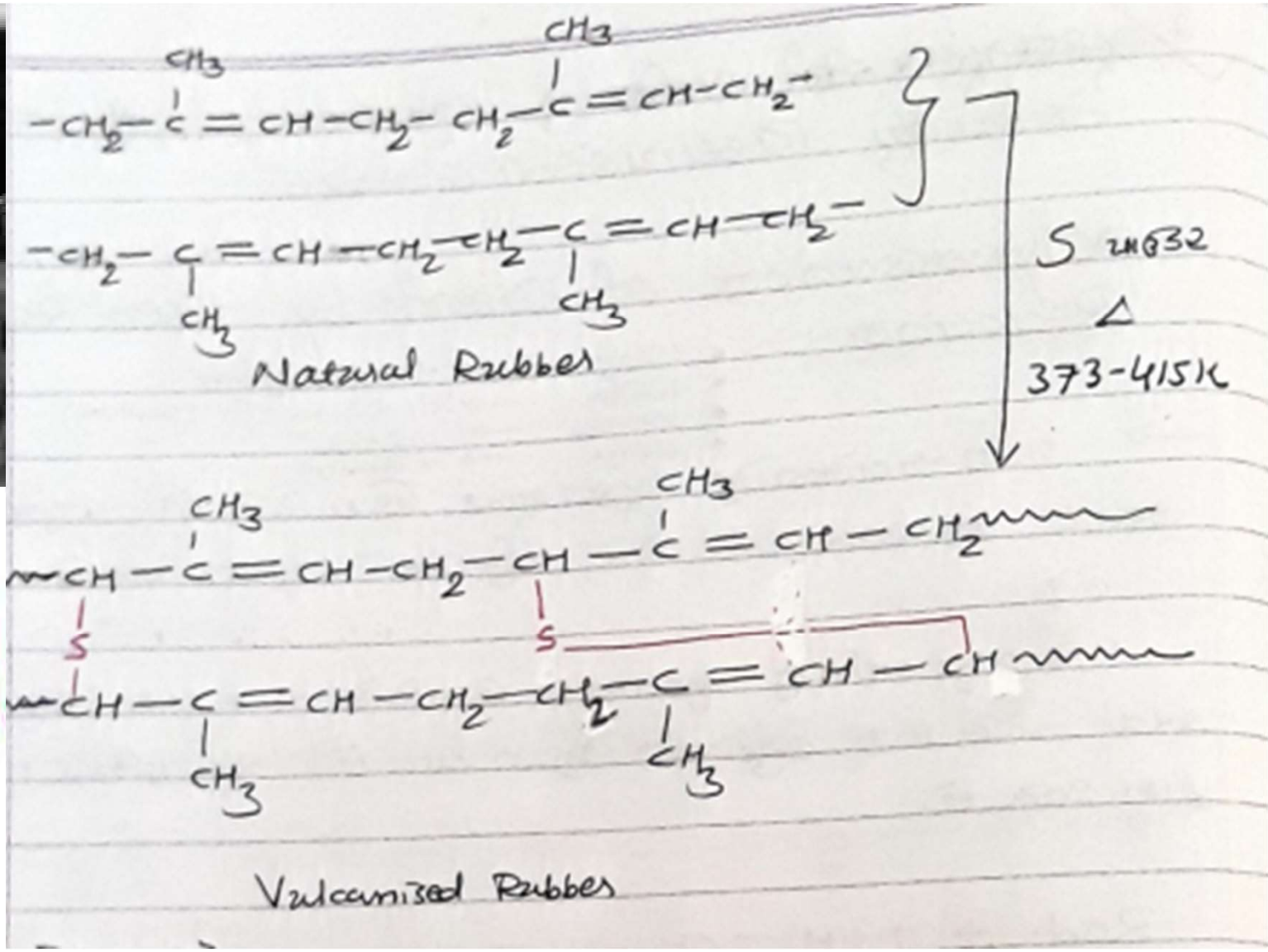
* Naturally Rubber :

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

આઇસોપ્રિન Cis- પોલી આઇસોપ્રિન (Naturally Rubber)

→ કુદરતી રબરને "S" સાથે (373-415K) ગરમ કરતા કુદરતી રબર ની ક્રોસ જોડાયેલા વચ્ચે "S" bridge બનાવે છે જેથી રબર સારુ બને છે અને મજબૂત બને છે. આ પદ્ધતિને Vulcanisation કહે છે & આ રબરને Vulcanised Rubber કહે છે.


ORIGINALS


Natural Rubber
S 2MB32
Δ
373-415K
Vulcanized Rubber

તો ૪ ઉમાલો.

ઉલોરોપ્રિન જું પોલિમરાઈઝેશન કરવાથી પોલિક્લોરોપ્રિન બને છે

જે કેટલીક બાબતોમાં કુદરતી રબરકરતાં ચડિયાતો ગુણધર્મો ધરાવે

પરંતુ oil, Gasolene માં અસરકારકતાની બાબતે ચડિયાતો છે

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

Chloroprene — polychloroprene

(Monomer)

Electrophilic Addition in Conjugated Diene or 1:4 Addition

1:4 Pentadiene + Br_2 → intermediate $\xrightarrow{Br_2}$ 1:4 Adduct

1:3 Butadiene + Br_2 → 1:2 & 1:4 Adduct

2:4 Hexadiene + HCl → 1:2 & 1:4 Adduct

1:4 Addition in Conjugated Diene :

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

(પ્રોટોન)
અનુબંધિત દ્વિબંધ ધરાવતાં ડાઈનની BB_r સાથે યોગશીલ
પ્રક્રિયા કરતાં 1 & 4 ના સ્થાને આવેલા દ્વિબંધ
આગળ B અને H_2 ક્રમશઃ ઉમેરાય છે અને નીચે દર્શાવેલ
પ્રમાણે આલ્કેન મળે છે. આ પ્રક્રિયાને 1:4 યોગશીલન
પ્રક્રિયા કહે છે.

C-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] પ્રમાણમાં

1 : 2 પ્રમાણમાં

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

1,2,4,5 ટેટ્રાબ્રોમો પ્રોપેન

તે પ્રમાણે,

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

1 : 3 બ્યુટાડાઈન

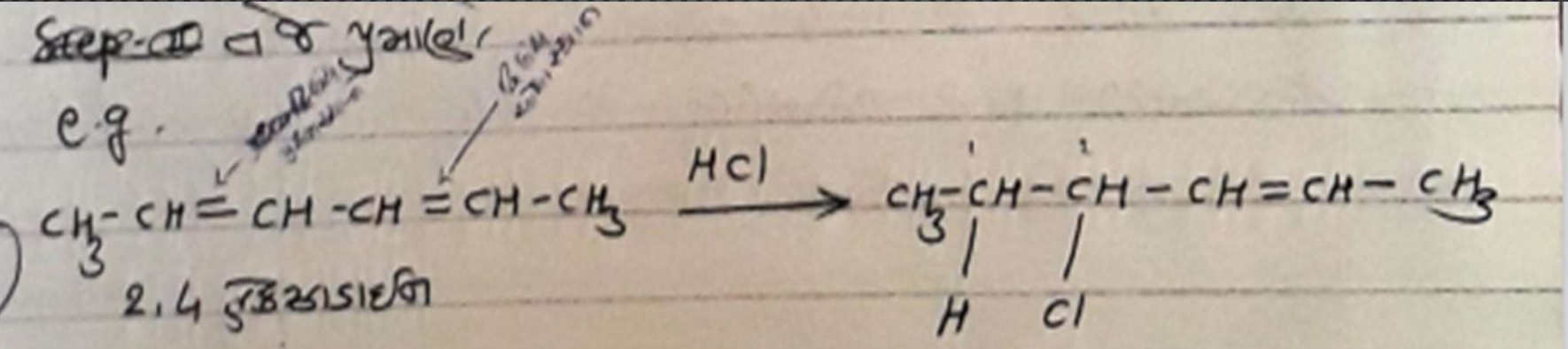
1, 2 ડાયબ્રોમો બ્યુટીન (1 : 2 પ્રમાણમાં)

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

1, 4 ડાયબ્રોમો 2-બ્યુટીન (1 : 4 પ્રમાણમાં)

Step-III এর উদাহরণ:

e.g.



$CH_3-CH=CH-CH=CH-CH_3 \xrightarrow{HCl} CH_3-\underset{H}{\underset{|}{CH}}-\underset{Cl}{\underset{|}{CH}}-CH=CH-CH_3$

2,4 ডাইক্লোরোহেক্সিন

4-ক্লোরো, 2 হেক্সিন (1:2 নামকরণ)

+

$CH_3-\underset{H}{\underset{|}{CH}}-CH=CH-\underset{Cl}{\underset{|}{CH}}-CH_3$

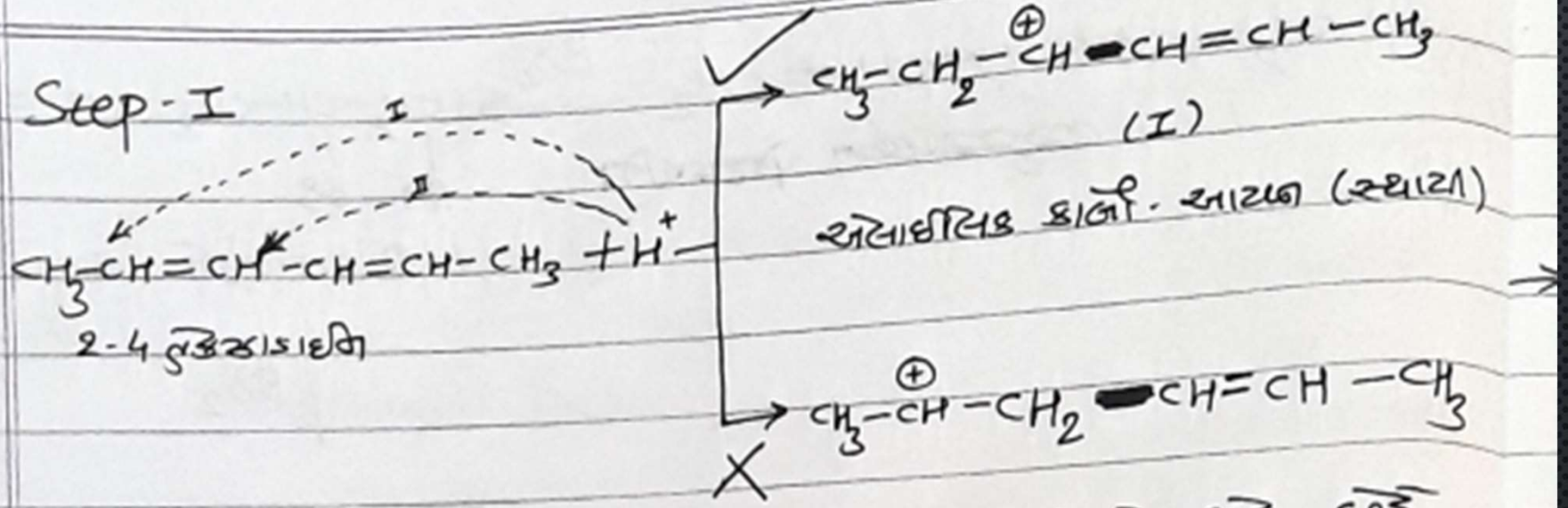
2-ক্লোরো, 3-হেক্সিন (1:4 নামকরণ)

eg (3)

(15)

Mechanism: પ્રક્રિયાવિધિ:

Step - I

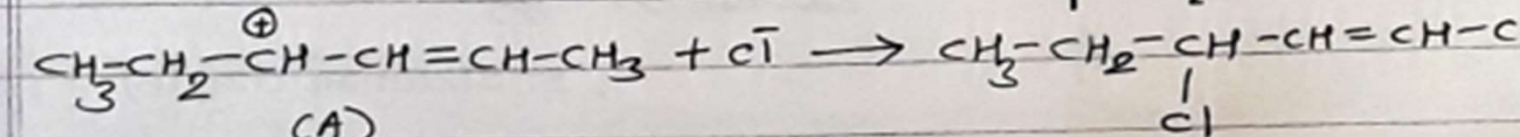


આમ પ્રથમ તબક્કામાં કાર્બ્યુગેટેડ ડાયીનમાં ગમે તો એક દ્વિબંધ ઇલેક્ટ્રોનાગ્રહી પ્રક્રિયા આપે છે & સ્થાયી એલાઈલિક કાર્બો. આયન બને છે. અહીં કાર્બો. આયન (I) ના બે સ્વરૂપો શક્ય છે.

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

(A) (B)

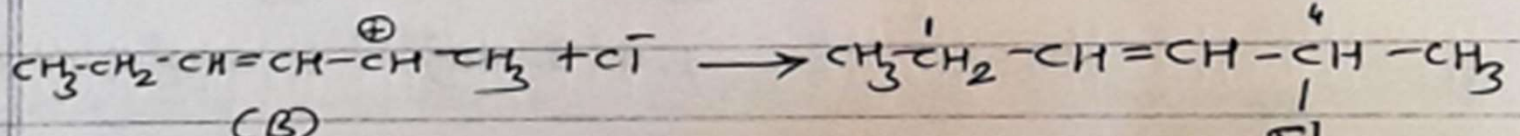
Step - II



(A)

(1 : 2 યોગશીલન)

+

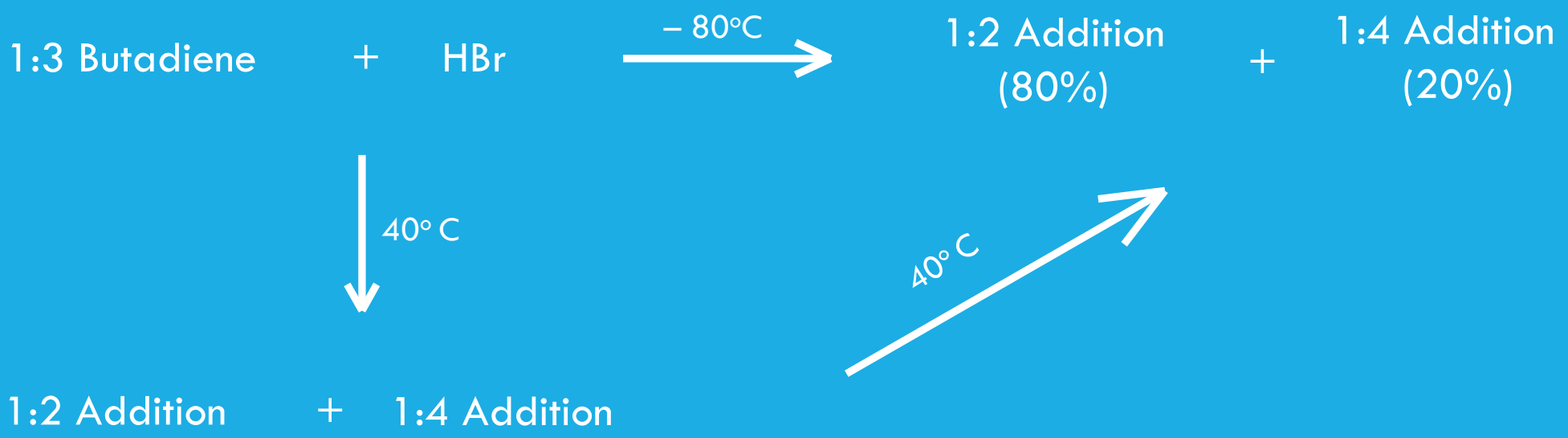


(B)

(1 : 4 યોગશીલન)

દ્વિતીય તબક્કામાં કાર્બો-આયન (A) & (B) ની Cl^- સાથે પ્રક્રિયા થતાં 1 : 2 કે 1 : 4 યોગશીલન પ્રક્રિયા થાય છે & આથી 1 : 2 યોગશીલન કે 1 : 4 યોગશીલન નીપજ મળે છે.

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



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

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

$CH_2=CH-CH=CH_2 + HBS$.

1:3 બ્યુટાડાઈન

$-80^\circ C$ (193K) ↓ ——— (313K) ↓ $40^\circ C$

$\overset{1}{C}H_2-\overset{2}{C}H-CH=CH_2$
H, BS (80%.)
(1:2 addition)

$\overset{1}{C}H_2-CH=CH-\overset{4}{C}H_2$
H, BS
(1:4 addition) (20%.)

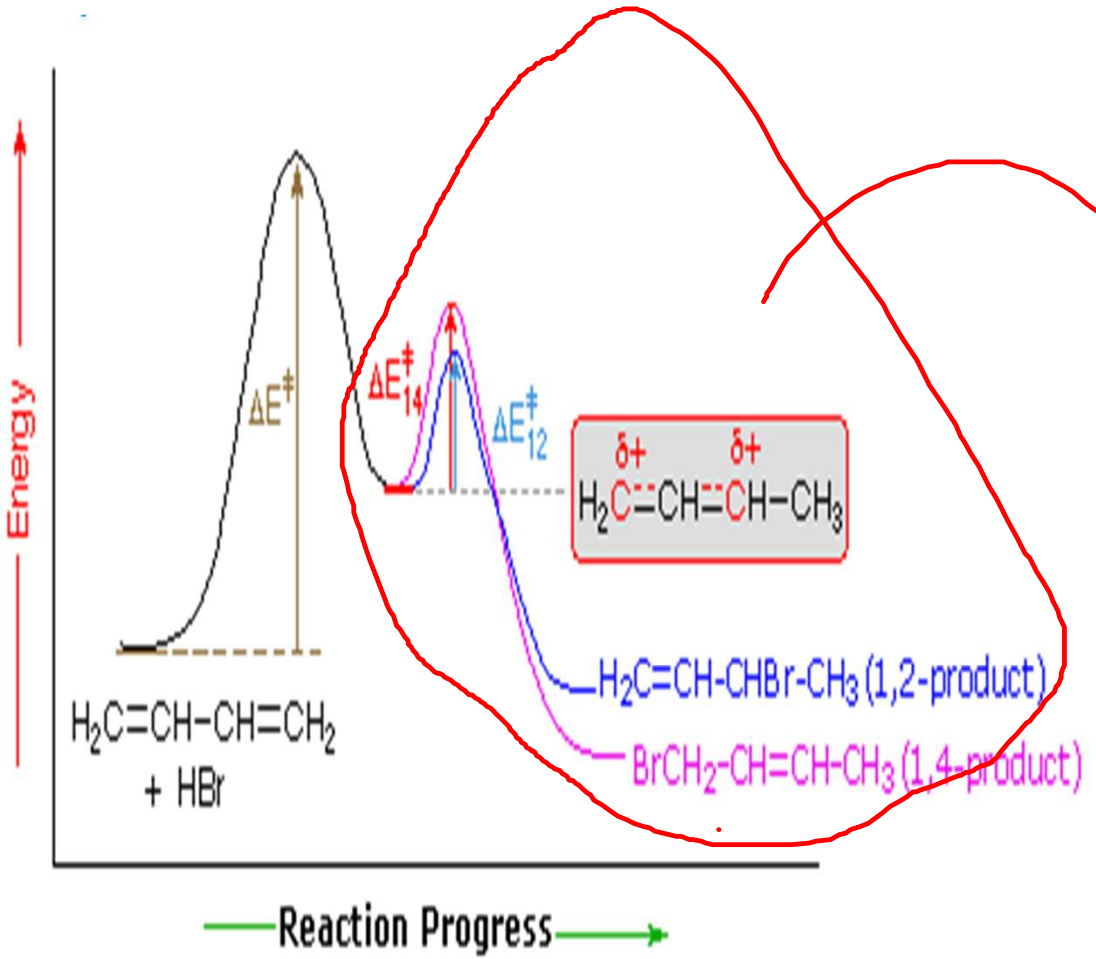
$\xrightarrow{40^\circ C}$

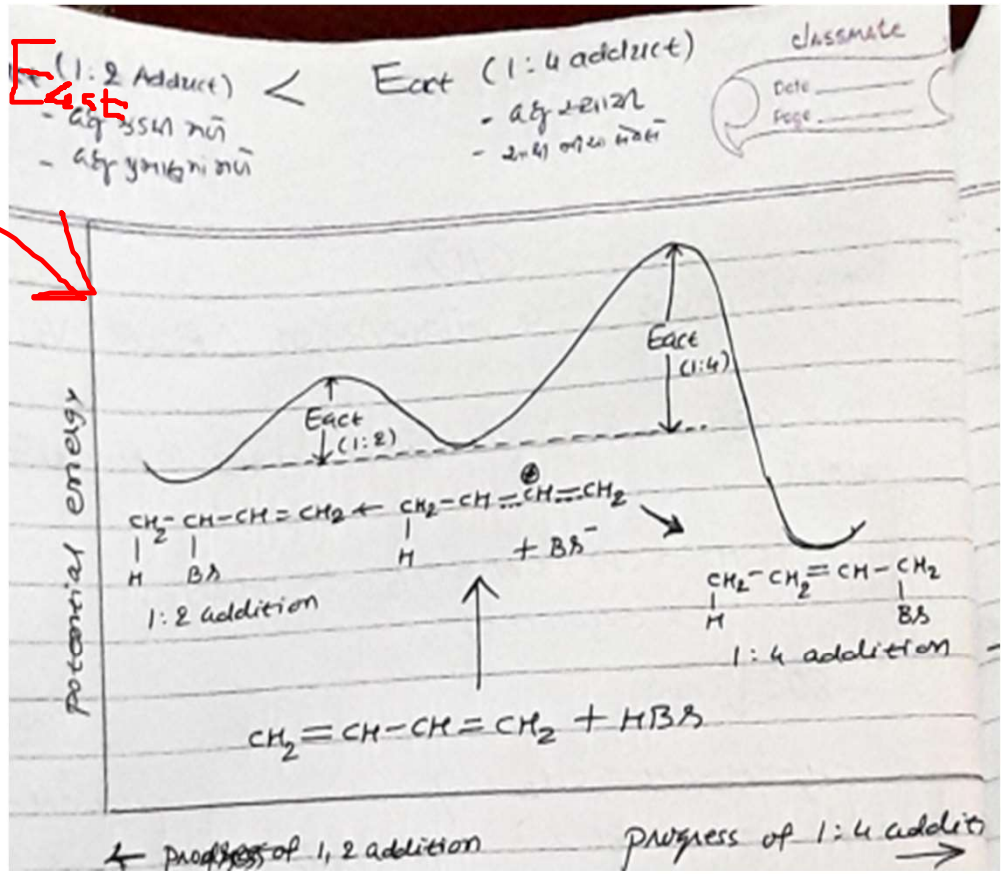
$\overset{1}{C}H_2-\overset{2}{C}H-CH=CH_2$
H, BS (20%.)
(1:2 addition)

$\overset{1}{C}H_2-CH=CH-\overset{4}{C}H_2$
H, BS
(1:4 addition) (80%.)

→ ઉપર દર્શાવ્યા મુજબ 1:3 બ્યુટાડાઈન ની HBS સાથે $-80^\circ C$ તાપમાને પ્રક્રિયા કરવાથી 80% 1:2 & 20% 1:4 નીપજ મળે છે જ્યારે $40^\circ C$ 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 $-80^\circ C$ 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 ને સંતુલન મિશ્રણમાં ફેરવાય છે. એમાં નીપજ


Energy
ΔE‡
ΔE‡14
ΔE‡12
δ+ δ+
H2C=CH-CH=CH-CH3
H2C=CH-CH=CH2
+ HBr
H2C=CH-CHBr-CH3 (1,2-product)
BrCH2-CH=CH-CH3 (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
progress of 1:4 addition

આલેખ પરથી કહી શકાય કે,
અહીં 1:3 બ્યુટાડાઇનની HBr સાથે પ્રક્રિયા થતાં પ્રથમ કાર્બોકેટાયન આયન ઉત્પન્ન થાય છે. આ કાર્બો. આયનો માંથી 1:4 કરતાં 1:2 નીપજ વધુ બને છે. આથી 1:4 કરતાં 1:2 નીપજની સક્રિયકરણ શક્તિ (Eg) ઓછી હોય છે. આમ છતાં પણ 1:2 નીપજ કરતાં 1:4 નીપજ વધુ સ્થાયી છે. આથી તેને નીચા લેવલે દર્શાવેલ છે.
ઉપર દર્શાવ્યા મુજબ 1:2 & 1:4 નીપજો (આલાઈલિક 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 વધુ ઝડપથી બને છે & વધુ ઝડપથી આયનીકરણ પામે 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 કરતાં 1:4 નીપજ વધુ ઝડપથી બને છે.

$$CH_2=CH-CH=CH_2 + HBr$$

$$\downarrow$$

$$CH_2-\underset{H}{CH}\cdots\overset{\oplus}{C}H\cdots CH_2 + Br^-$$

(કાર્બોકેટાયન આયન)

$CH_2-CH(H)-CH=CH_2$ (Br)
1:2 નીપજ

$CH_2-CH=CH-CH_2$ (H, Br)
1:4 નીપજ

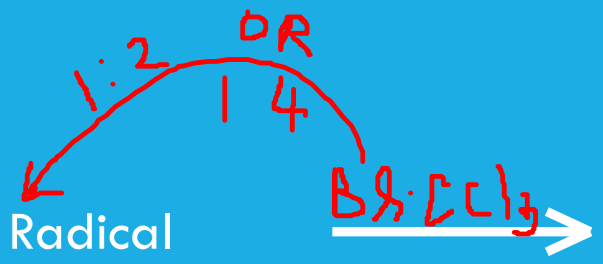
(18)

Free Radical Addition in Conjugated Diene

Peroxide $\longrightarrow$ Rad •

Rad• + Br – CCl_3 $\longrightarrow$ Rad – Br + • CCl_3

1:3 Butadiene + • CCl_3 $\longrightarrow$ 1° Free radical + 2° Free radical



Allylic Free Radical (stable)

Allylic Free Radical $\longrightarrow$ 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/rAKjN99FIhU

https://youtu.be/VCIr6T2NhLo

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

(i) Initiation : प्रारंभ :

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

(ii) Propagation : वृद्धि :

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

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

New free radical

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

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

3, 4 dibromo hexane

(iii) Termination : अंत :

$$BrBr\cdot + BrBr\cdot \longrightarrow BrBr_2$$

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

$$CH_3-CH_2-\underset{\displaystyle BrBr}{\underset{|}{CH}}-\underset{\displaystyle BrBr}{\underset{|}{CH}}-CH_2-CH_3$$

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

1-Propene

(i) Initiation :

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

(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

→ ઉપરના લાયમાંથી પ્રોપિલની Cl_2 સાથેની પ્રક્રિયા થી એલાઈલ ક્લોરાઈડ બને છે. આ પ્રક્રિયા addition નથી પરંતુ - substitution પ્રકારની છે.

→ આ પ્રક્રિયામાં π બંધ ધરાવતા પ્રોપિલમાં $\dot{C}l$ ઉમેરાય છે & ત્યારબાદ પુનિવર્સિ રીતે દૂર પણ થઈ જાય છે. આથી π બંધને કોઈ અસર થતી નથી & આથી જ વિલોપન નથી પરંતુ વિસ્થાપન પ્રક્રિયા થઈને એલાઈલ ક્લોરાઈડ જીપજ તરીકે મળે છે.

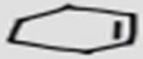
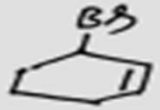
• પ્રક્રિયા પૂર્ણ કરો. Complete the Reactions :

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

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

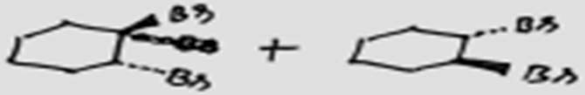
3-Bromo, 1-propene

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

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

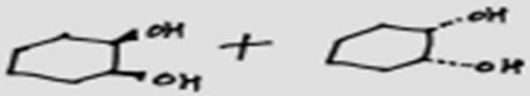
3- Bromo Cyclo hexene

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

Ans:  $\xrightarrow{Br_2}$ 

Anti

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

 $\xrightarrow[H_2O_2]{KMnO_4}$ 

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!