

* 10. HALOGEN DERIVATIVE *

Q. What are halogen derivative of alkane and how are they classified?

⇒ The replacement of one or more hydrogen atom from alkane by the same no. of halogen atom.

Classification:

i) Monohydrogen derivative (RX):

The replacement of one hydrogen atom from alkane by the same no. of halogen atom.

eg. $\text{CH}_3\text{-Cl}$

C.N (Alkyl Halide) : Methyl chloride.

I.N (Halo Alkane) : Chloro Methane.

ii) Polyhalogen derivative:

The replacement of more than one hydrogen atom from alkane by the same no. of halogen atom.

a) Dihalogen derivative:

The replacement of two hydrogen atom from alkane by the same no. of halogen atom.

eg.

$\text{CH}_2\text{-CH}_2$ (vicinal dihalide)

$\begin{array}{cc} | & | \\ \text{Cl} & \text{Cl} \end{array}$

I.N : 1,2 - Dichloro ethane.

b) Trihalogen derivative:

The replacement of three hydrogen atom from alkane by the same no. of halogen atom.

eg. CHCl_3

C.N : Chloroform

I.N : 1,1,1 - Dichloro methane.

CH_3 : 1° (Primary)
 CH : 2° (Secondary)
 C : 3° (Tertiary)

} For alkyl halide.

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c) Tetrahalogen derivative:

The replacement of four hydrogen atom from alkane by the same no. of halogen atom.

eg. CCl_4

I.N: ~~Carbon~~ 1,1,1,1-Tetrachloro Methane.

C.N: Carbon Tetrachloride

What are the alkyl halide & how are they classified?

The monohalogen derivative of alkane is called as Alkyl halide. OR The replacement of ^{one} hydrogen atom from alkane by the same no. of halogen atom.

Classification:

i) 1° alkyl halide: The alkyl halide in which halogen atom is attached to primary 'C' atom.

For eg. $\text{CH}_3\text{-CH}_2\text{-Cl}$

C.N:

I.N:

ii) 2° alkyl halide: The alkyl halide in which halogen atom is attached to secondary 'C' atom.

For eg. $\text{CH}_3\text{-CH}(\text{Cl})\text{-CH}_3$

C.N: Iso Prop. Propyl chloride

I.N: 2-Chloro propane

$\text{CH}_3\text{-CH}(\text{Cl})\text{-CH}_2\text{-CH}_3$

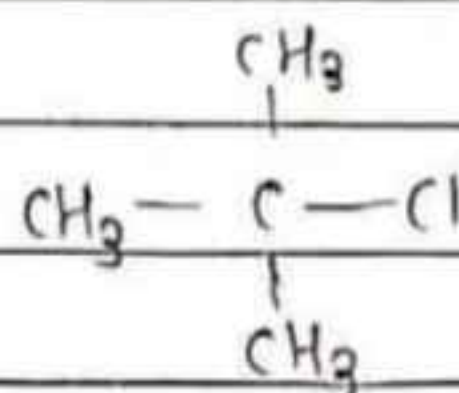
C.N: Sec. Butyl chloride

I.N: 2-chloro Butane

Secondary तेव्हा वापरायचा जेव्हा Halogen हा 'CH' को attach असतो.

iii) Tertiary / 3° alkyl halide: The alkyl halide in which halogen atom is attached to tertiary 'C' atom.

For eg.



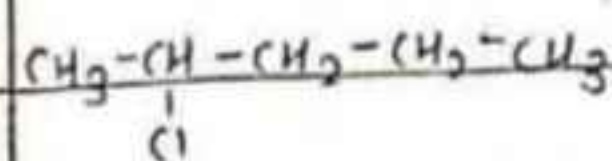
C.N: Ter. Methyl chloride

I.N: 2-chloro, 2-methyl Propane.

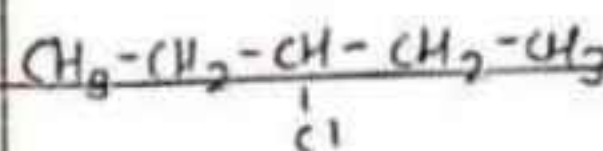
• IUPAC Nomenclature of Alkyl Halide:

Se. No.	M.F.	Structure	C.N	IUPAC	1°/2°/3°
1.	CH ₃ Cl	CH ₃ Cl	Methyl chloride	1-chloro methane	1°
2.	C ₂ H ₅ Cl	CH ₃ -CH ₂ -Cl	Ethyl chloride	Chloro ethane	1°
3.	C ₃ H ₇ Cl	CH ₃ -CH ₂ -CH ₂ -Cl	n-propyl chloride	2-chloro propane.	1°
	Isomer: 2 =	$\begin{array}{c} \text{CH}_3 - \text{CH} - \text{CH}_3 \\ \\ \text{Cl} \end{array}$	...		2°
4.	C ₄ H ₉ Cl	CH ₃ -CH ₂ -CH ₂ -CH ₂ -Cl	n-Butyl chloride	Chloro Butane	1°
	Isomer: 4 =	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3 - \text{CH} - \text{CH}_2 - \text{Cl} \end{array}$	Iso Butyl chloride	1-chloro, 2-methyl propane	1°
		$\begin{array}{c} \text{CH}_3 - \text{CH} - \text{CH}_2 - \text{CH}_3 \\ \\ \text{Cl} \end{array}$	Sec-Butyl chloride	2-chloro Butane.	2°
		$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3 - \text{C} - \text{Cl} \\ \\ \text{CH}_3 \end{array}$	Ter-Butyl chloride	2-chloro, 2-methyl propane.	3°
5.	C ₅ H ₁₁ Cl.	CH ₃ -CH ₂ -CH ₂ -CH ₂ -CH ₂ -Cl	n-Pentyl chloride	chloro Pentane	1°
	Isomer: 8	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{Cl} \end{array}$			1°
	1°: 4				
	2°: 3				
	3°: 1.	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3 - \text{CH}_2 - \text{CH} - \text{CH}_2 - \text{Cl} \end{array}$			1°

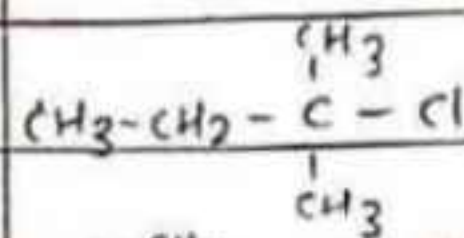
Note: • तीन पेड़ा आसत असल की 'n' लिखित.



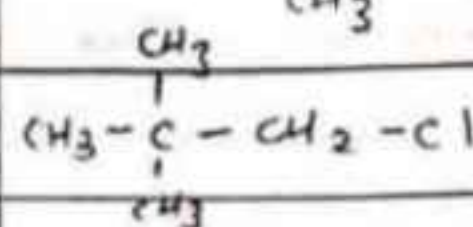
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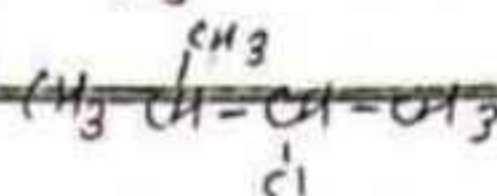
2°



3°

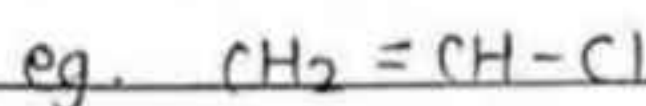


1°



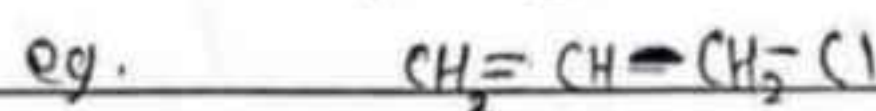
2°

1. Vinyl/Vinylic halide : The halogen atom is attached to sp^2 hybridised 'C' atom is called Vinyl halide.



Vinyl chloride

2. Allylic halide : A halogen atom is attached to sp^3 then sp^2 hybridised 'C' atom.



3. Benzylic halide : The halogen atom is attached to sp^3 then directly attach to Benzene ring which shows sp^2 hybridised 'C' atom.

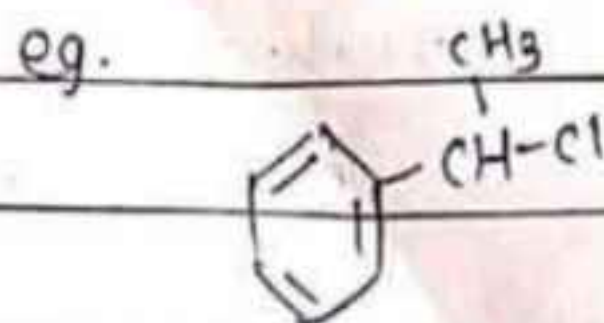
a) 1° Benzylic halide:



C.N : Benzyl chloride.

I.N : 1-chloro 1-phenyl methane.

b) 2° Benzylic halide:

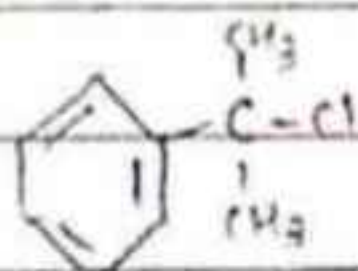


I.N : 1-chloro 1-phenyl ethane

Note:

Benzyl तेव्हाच वापरायचं जेव्हा Benzene ring ला ज्यादाचं 'CH₂' लागेल नाहीत Phenyl किंवा Aryl वापरायचं.

eq.



- Methods Of Preparation Of Alkyl Halide:

Note: $F \cdot G = (-OH)$

Prefix : Hydroxy Suffix : ol

a) Action of HCl [Note: - In this reaction 1° & 2° alcohol reacts with Lucas reagent is a mix of conc. $\text{HCl} + \text{ZnCl}_2$

Q. In 3° also, reaction take place at Room temp.]

* What happen when HCl reacts with 1°/2°/3° alcohol :

$\text{CH}_3\text{-CH}_2\text{-OH} + \text{HCl}$	$\xrightarrow{\text{ZnCl}_2}$	$\text{CH}_3\text{-CH}_2\text{-Cl} + \text{HOH}$
Ethyl alcohol	alco.	Ethyl chloride
Ethanol		Chloro Ethane

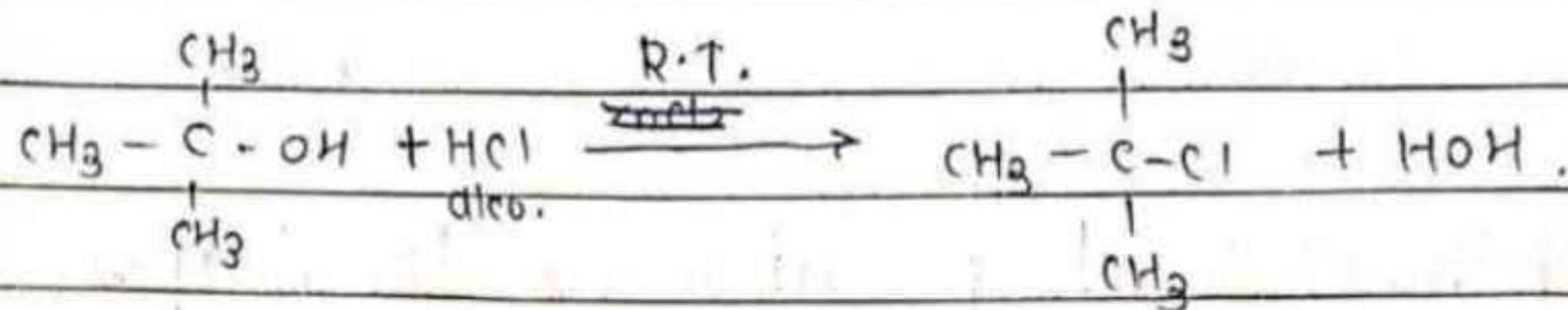
When Ethanol reacts with alcoholic Hydrochloric acid and zinc dichloride to form Ethyl chloride with removal of water.

$$\text{CH}_3 - \underset{\text{OH}}{\text{CH}} - \text{CH}_3 + \text{HCl} \xrightarrow{\text{ZnCl}_2} \text{CH}_3 - \underset{\text{Cl}}{\text{CH}} - \text{CH}_3 + \text{H}_2\text{O}$$

Propyl alcohol Propyl chloride
Propan-2-ol. 2-chloropropane

When Propanol reacts with alcoholic Hydrochloric acid and Zinc dichloride to form Propyl chloride with removal of water.

• 3° alcohol :



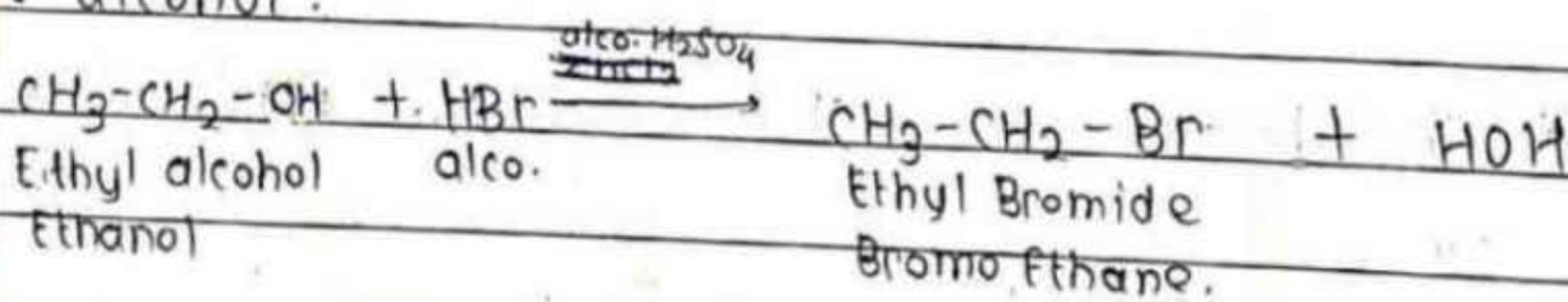
2-hydroxy 2-methyl propane.

2-chloro 2-methyl propane.

When 2-hydroxy 2-methyl propane reacts alco. HCl with presence of ~~ZnCl₂~~ to form 2-chloro 2-methyl propane with ^{removal of} water. Room temp.

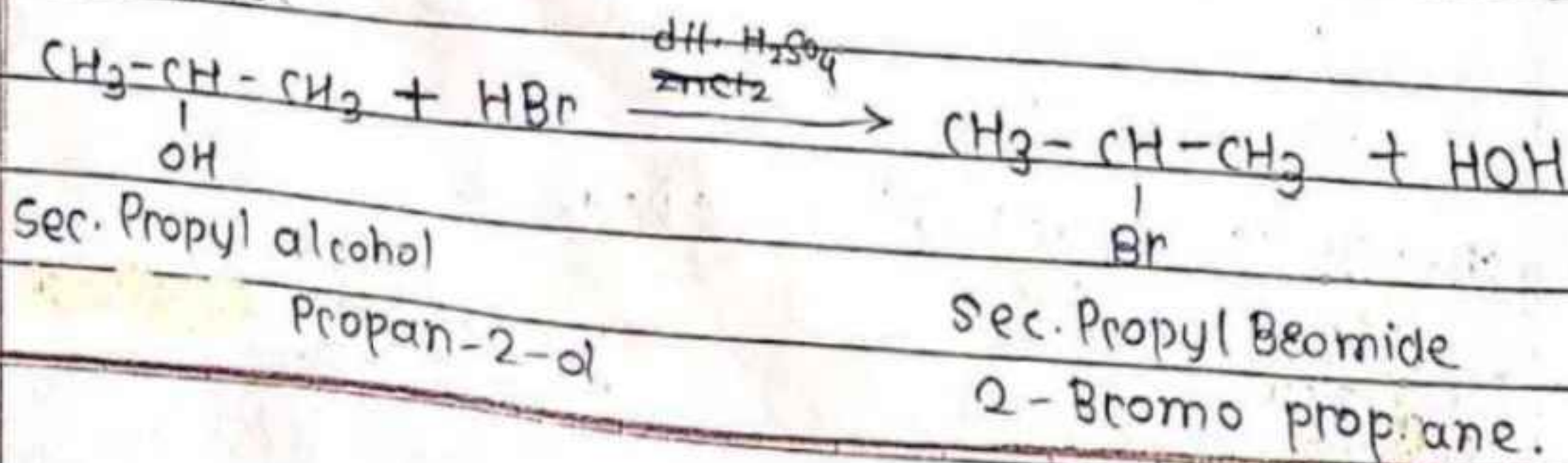
- b) Action of HBr: [Note: - 1° alcohol reacts with NaBr + alco. H₂SO₄ + catalyst are used.
- 2° alcohol reacts with NaBr + dil. H₂SO₄ + catalyst are used.]

• 1° alcohol :



When Ethanol reacts with Hydrogen Bromide and zinc dichloride to form Ethyl Bromide with removal of water.

• 2° alcohol :

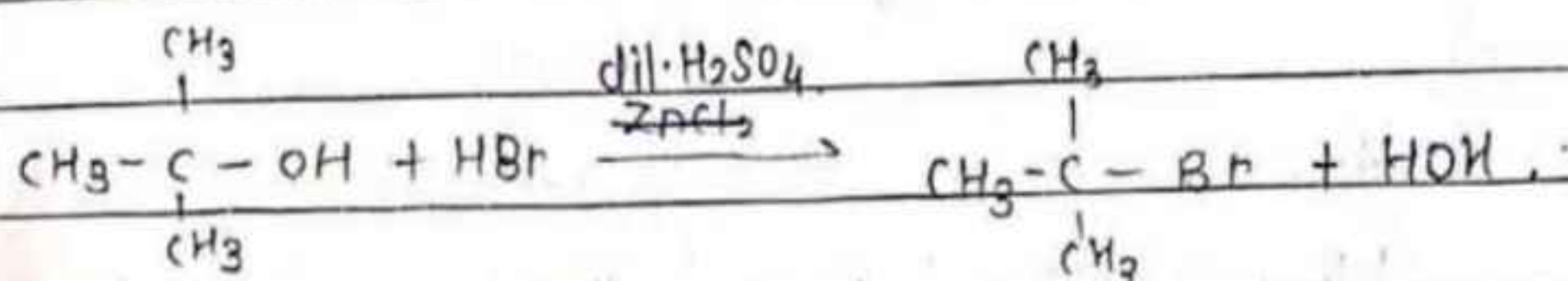


Sec. Propyl alcohol
Propan-2-ol

Sec. Propyl Bromide
2-Bromo propane.

When Sec. Propyl alcohol reacts with Hydrogen Bromide with presence of ~~zinc dichloride~~ and forms 2-Bromo propane with ^{removal of} water.
dilute sulphuric acid

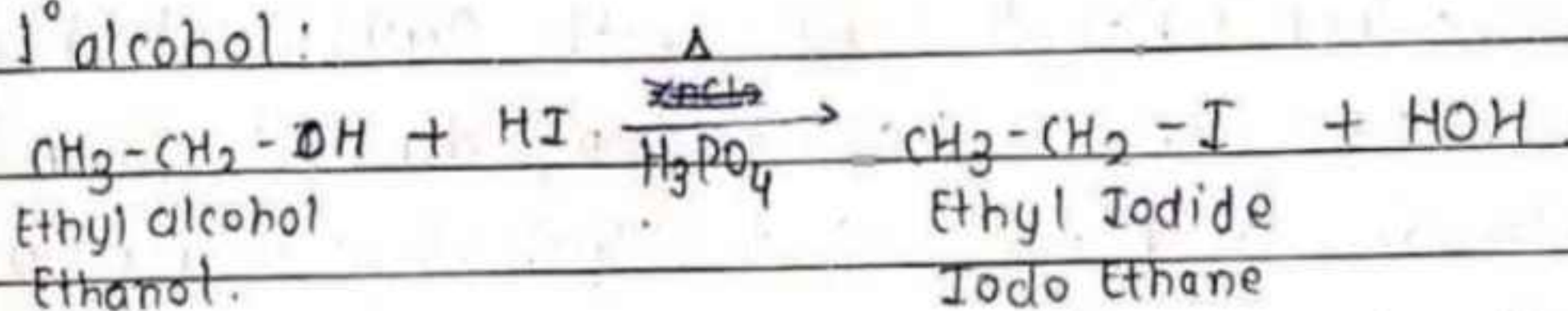
• 3° alcohol :



When Ter. propyl alcohol reacts with Hydrogen Bromide in presence of ~~zinc dichloride~~ and forms Ter. propyl bromide with removal of water.
dilute sulphuric acid

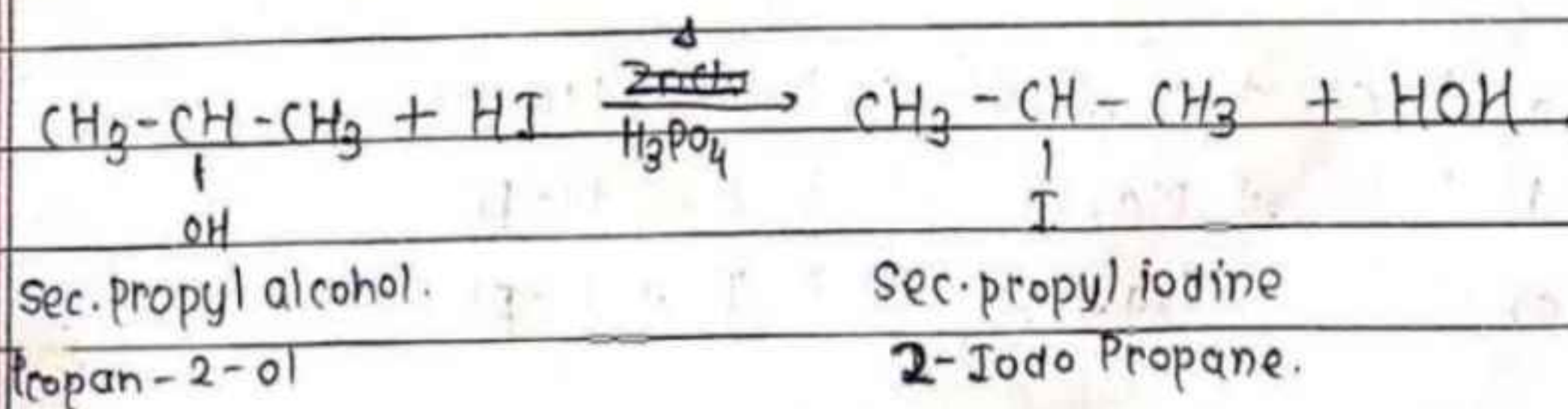
c) Action of HI : [Note : - Heating alcohols with 'Na' or 'K' iodide with 95% phosphoric acid. $[\text{H}_3\text{PO}_4]$.
- Catalyst is Heat (Δ)]

• 1° alcohol :



When Ethanol reacts with Hydrogen Iodine in presence of ^{phosphoric acid} ~~zinc chloride~~ and forms Ethyl Iodide with water removal.

• 2° alcohol :

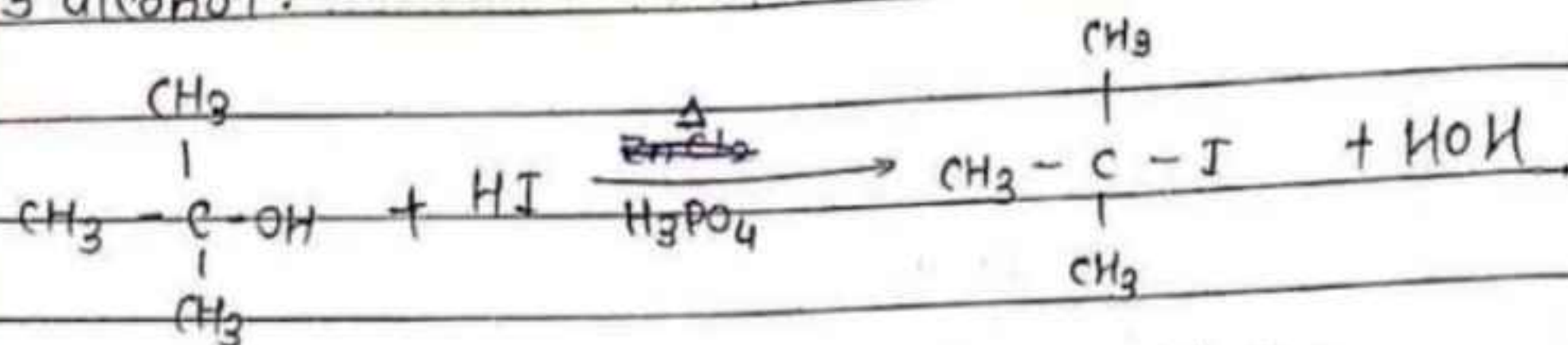


When Propan-2-ol reacts with Hydrogen Iodine in presence of ^{phosphoric acid} ~~zinc dichloride~~ to form Sec. propyl iodine with removal of water.

Note: i) pyridine = C_5H_5N



• 3° alcohol:

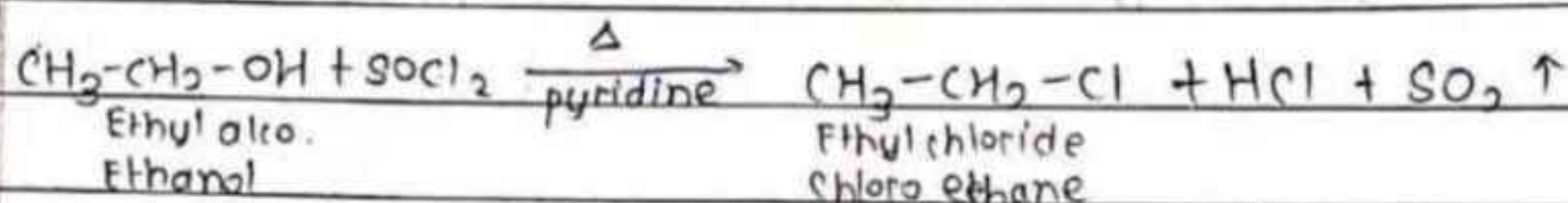


Ter. propyl alcohol

Ter. propyl iodine

When Ter. propyl alcohol reacts with Hydrogen Iodine in presence of ~~zinc~~ phosphoric acid to form Tertiary propyl iodine with removal of water.

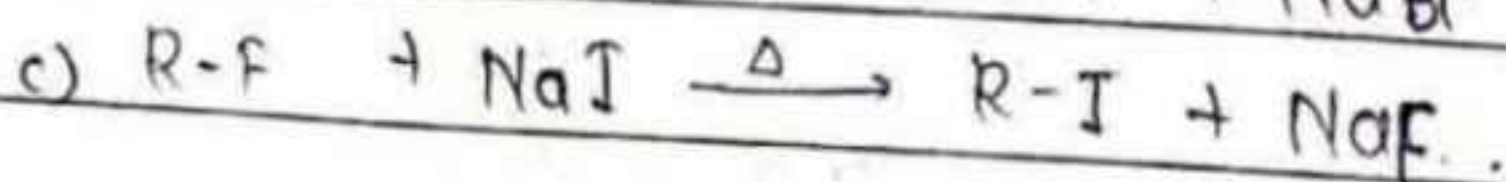
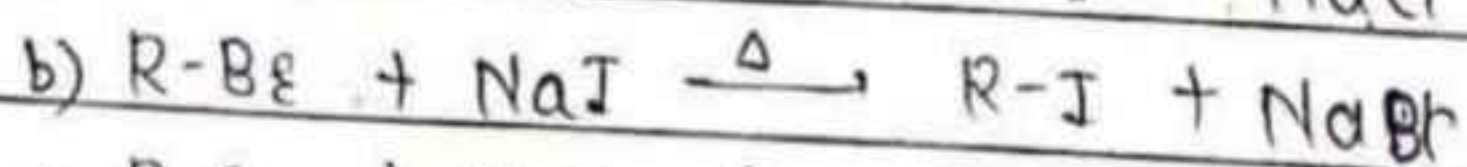
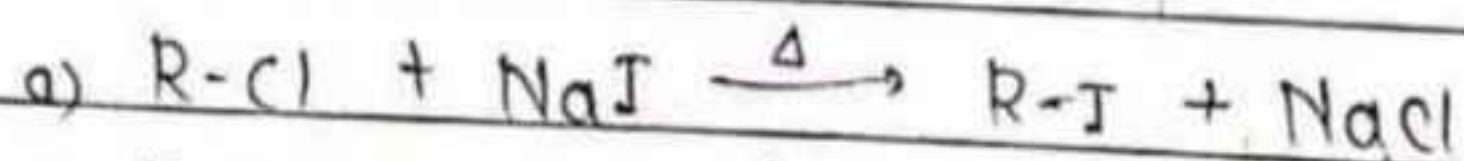
ii) From Thionyl chloride / Sulphonyl chloride:



When Ethanol reacts with Sulphonyl chloride with presence of heat and pyridine to form Ethyl chloride with removal of Hydrochloric acid and Sulphuric dioxide.

2. From halogen exchange:

i) Finkelstein reaction:

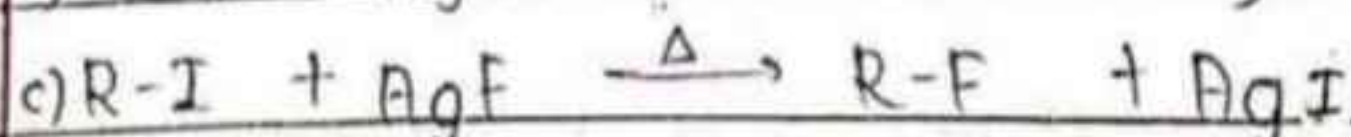
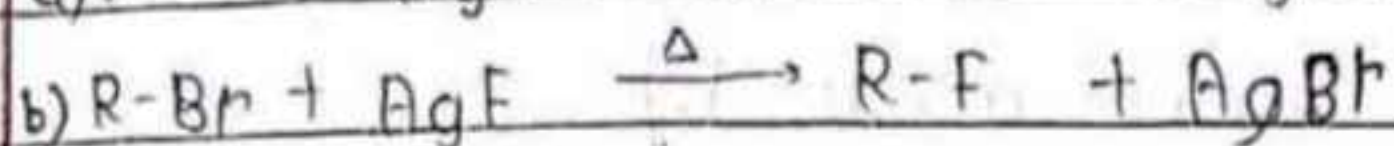
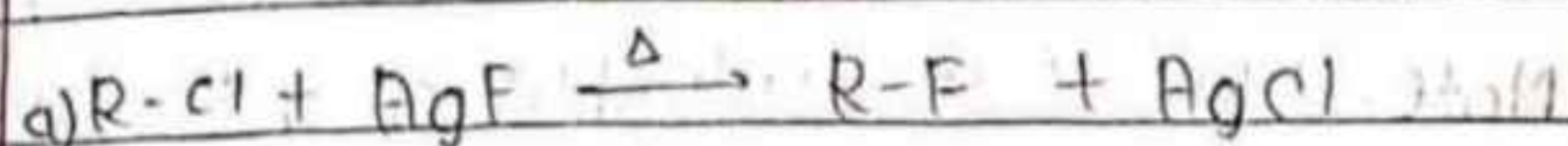


a) When Alkyl chloride reacts with Sodium Iodide in presence of heat to form Alkyl Iodine with removal of Sodium chloride

b) When Alkyl Bromide reacts with Sodium Iodide in presence of heat to form Alkyl Iodine with removal of Sodium Bromide

c) When Alkyl Fluoride reacts with Sodium Iodide in presence of heat and forms Alkyl Iodide with removal of Sodium Fluoride.

ii) Swartz Reaction : [Note: In this reaction AgF , CoF_2 , HgF_2 , SnF_3 reagent are used]



a) When Alkyl chloride reacts with Silver Fluoride in presence of heat to form Alkyl Fluoride with removal of Silver chloride

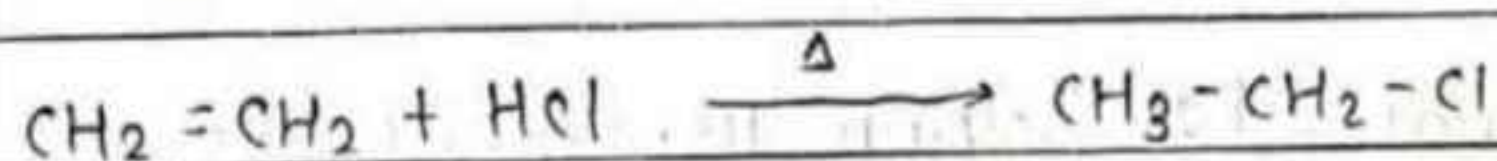
b) When Alkyl Bromide reacts with Silver Fluoride in presence of heat to form Alkyl Fluoride with removal of Silver Bromide.

c) When Alkyl Iodide reacts with Silver Fluoride in presence of heat to form Alkyl Fluoride with removal of Silver Iodide.

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3. Sym. From Alkene:-

i) Symmetrical Alkene (Addition of HX):



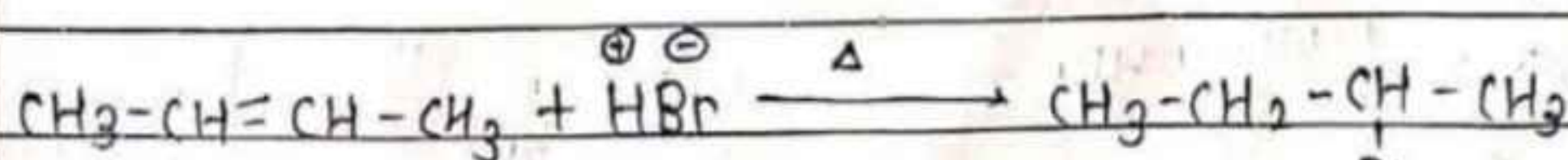
Ethylene

Ethyl chloride

Ethene

Chloro Ethane.

When Ethylene reacts with Hydrochloric acid and forms Ethyl chloride/Chloro Ethane.



β Butylene

Sec. Butyl Bromide

But-2-ene

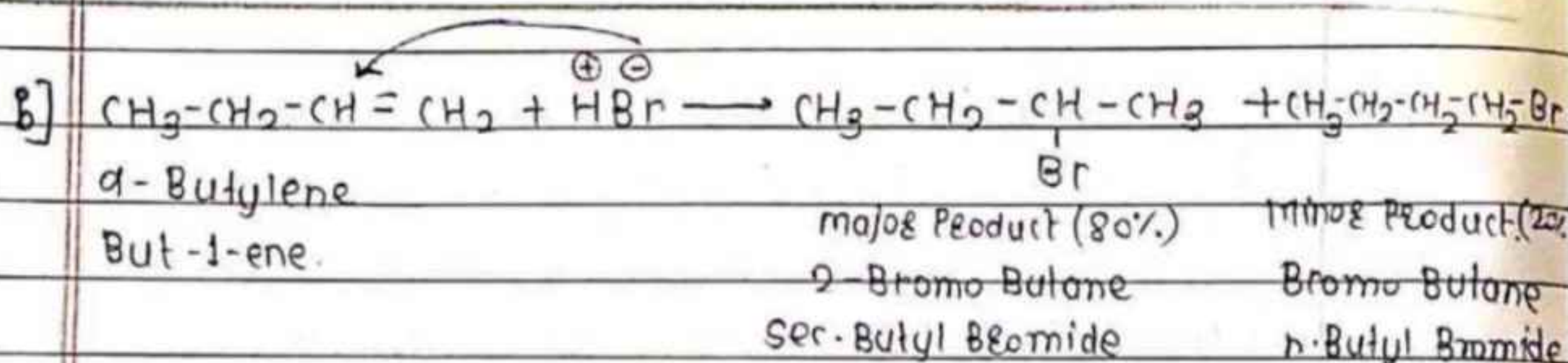
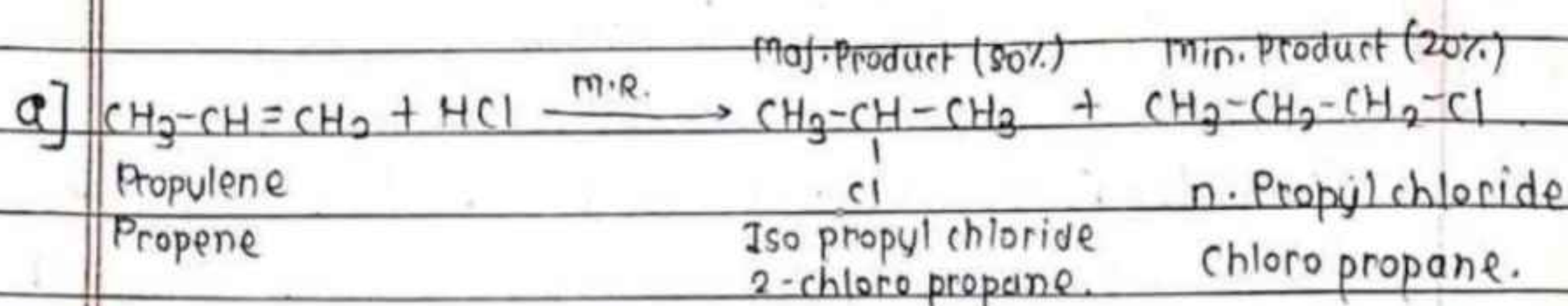
2-Bromo Butane

When β Butylene reacts Hydrochloric acid to form Sec. Butyl Bromide.

ii) Unsymmetrical Alkene :

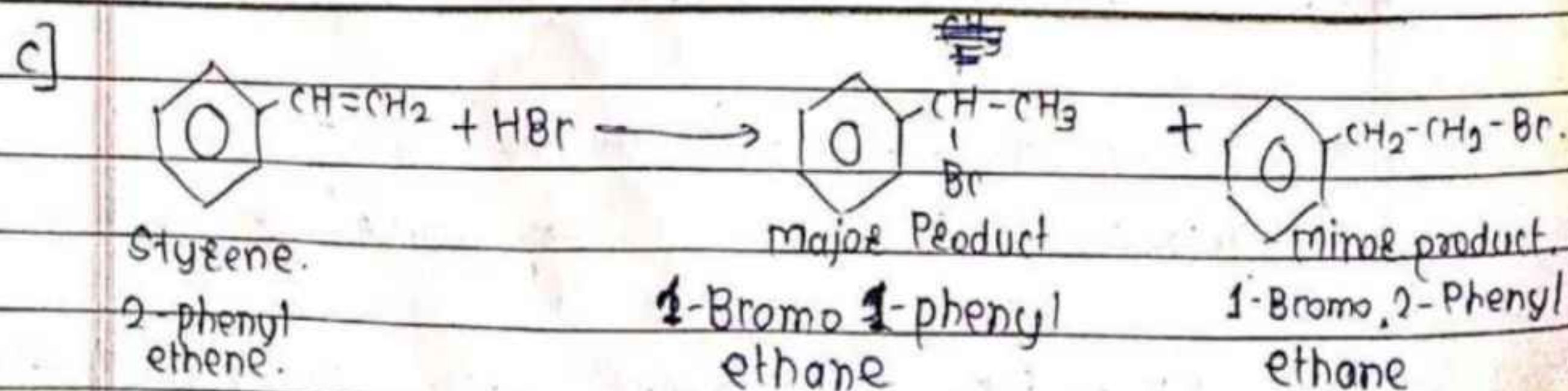
a) Markownikov's Rule : The unsymmetrical reagent add to unsymmetrical alkene the negative part of reagent get attached to 'c' atom having less no. 'H' atom.

[Note: M.R. it is applicable only HCl, HBr, HI reagent are used.]



When α-Butylene reacts with Hydrogen Bromide to form Secondary Butyl Bromide as a Major Product and Bromo Butane as a Minor product.

a) Sentence remained :- When propylene reacts with Hydrochloric acid to form Iso propyl chloride as a major product and chloro propane as a minor product.

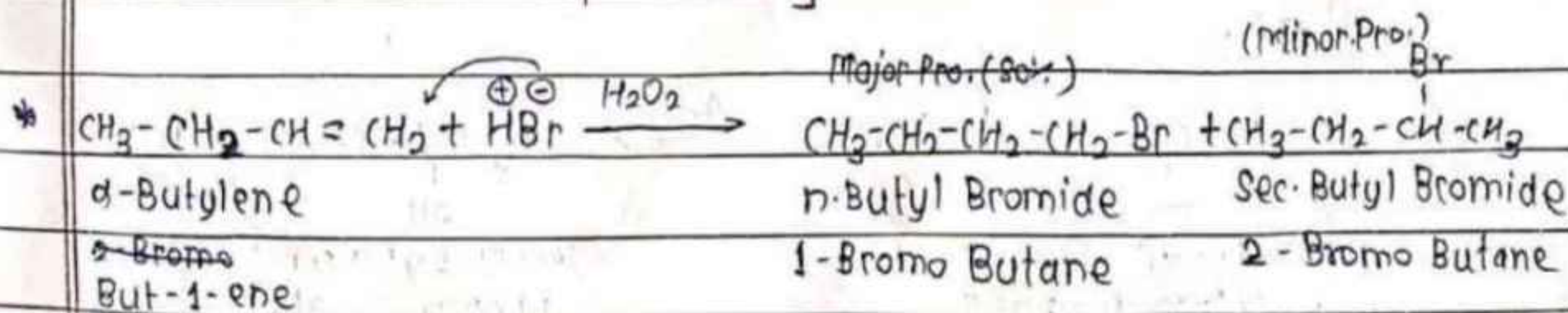


Q. When Styrene reacts with Hydrogen Bromide reacts with 1-Bromo, 1-phenyl ethane as a major product and 1-Bromo, 2-phenyl ethane as a minor product.

b) Antimarkownikov's Rule / Kharasch effect / Kharasch-mayo effect / peroxide effect :

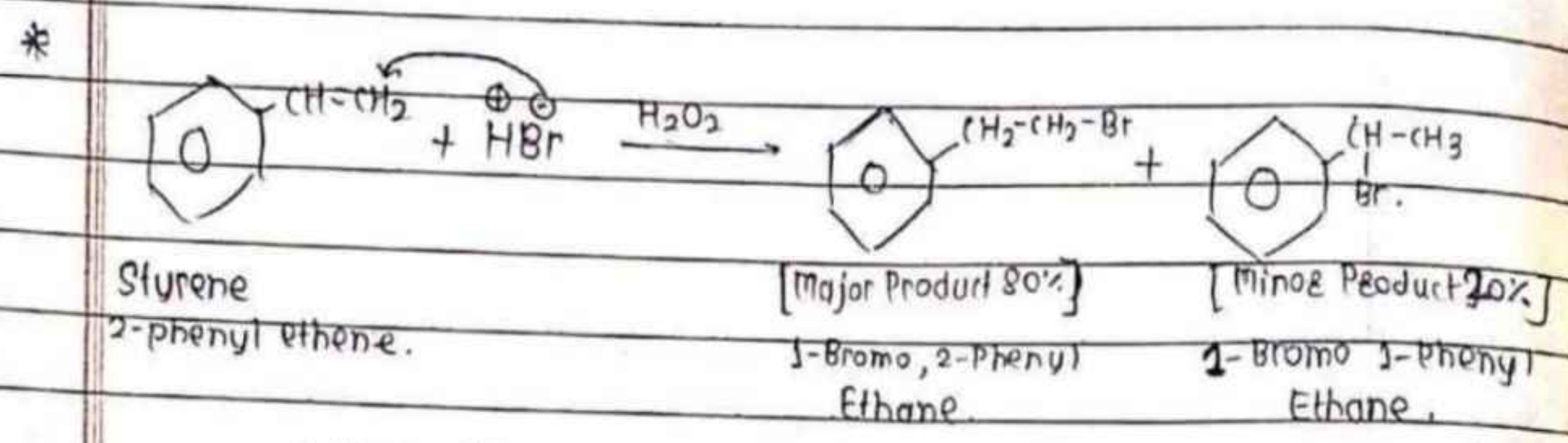
The unsymmetrical reagent add to unsymmetrical alkene the negative part of reagent get attached to 'C' atom having more no. of 'H' atom.

[Note: It is applicable only for HBr in presence of H_2O_2 .]



Note: Antimarkownikov's Rule मध्ये H_2O_2 catalyst असतो.

When α -Butylene reacts with Hydrogen Bromide in presence of Hydrogen peroxide to form n-Butyl Bromide as a major product and 2-Bromo Butane as a minor product.

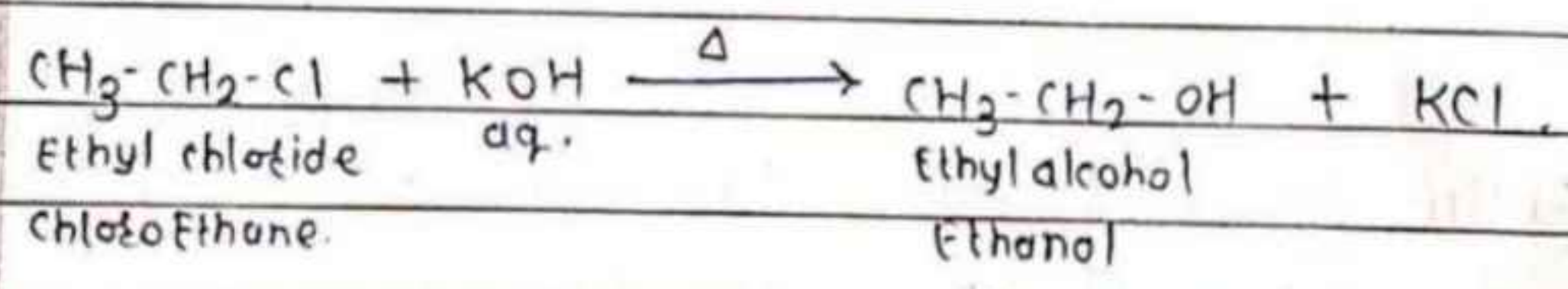


When Styrene reacts with Hydrogen Bromide in presence of Hydrogen peroxide to form 1-Bromo, 2-Phenyl Ethane as a Major Product and 1-Bromo, 1-Phenyl Ethane as a Minor Product.

• Reactions of Alkyl Halide:-

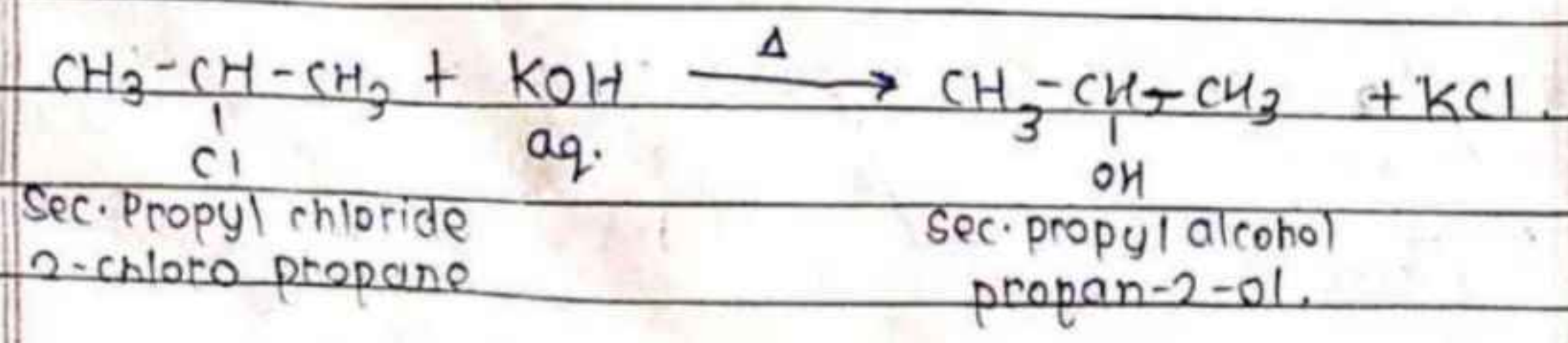
1. Action of aqueous KOH : (Always formation of alcohol).

1°:-



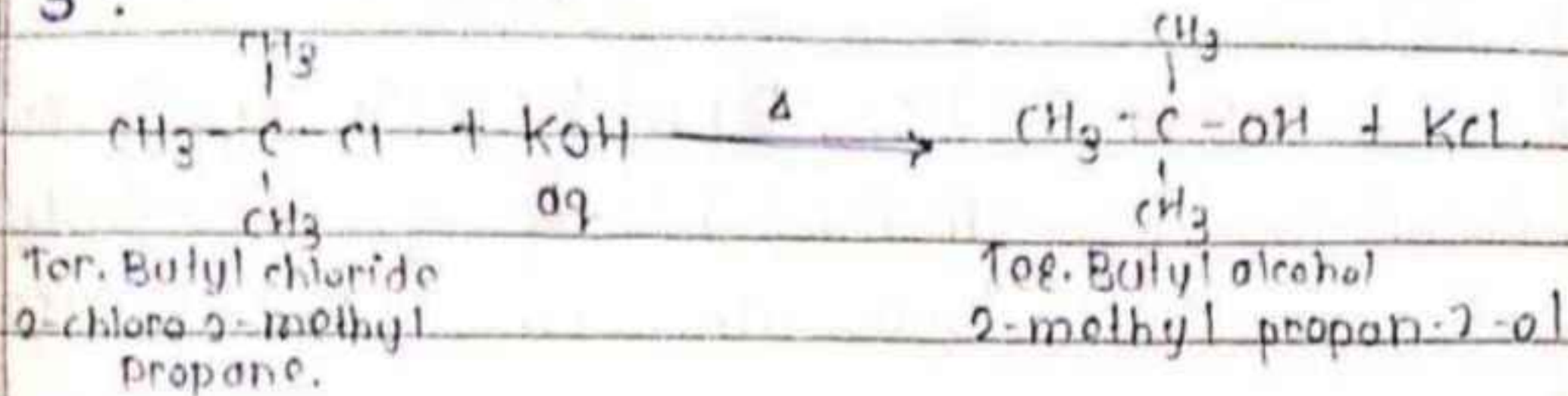
When Ethyl chloride reacts with aqueous Potassium chloride hydroxide on heating to form Ethanol with removal of Potassium chloride.

2°:-



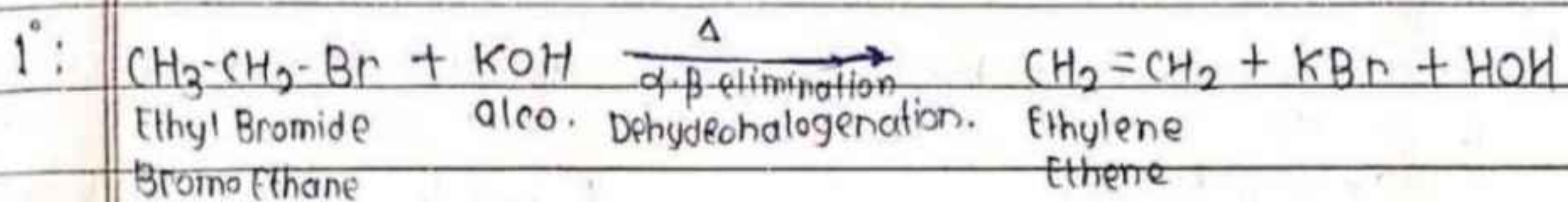
When Sec. propyl chloride reacts with aqueous Potassium hydroxide on heating to form propan-2-ol with removal of Potassium Chloride.

3°:

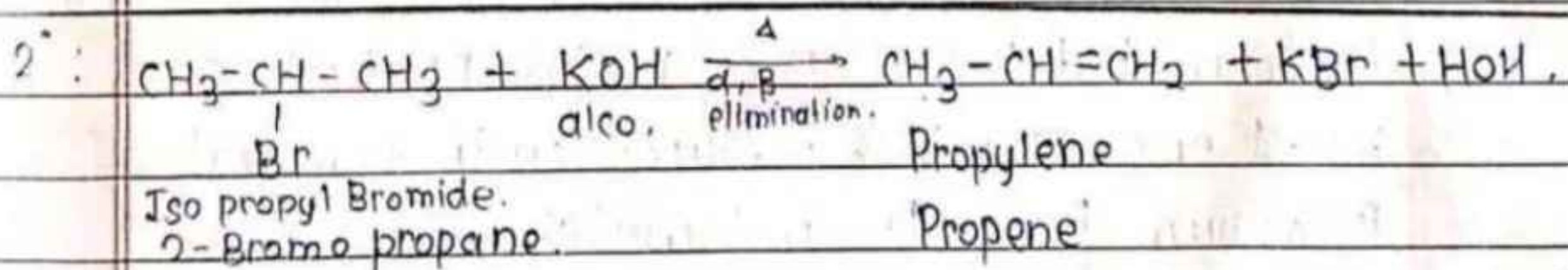


When 2-chloro, 2-methyl propane reacts with aqueous Potassium hydroxide on heating to form Tertiary Butyl alcohol with removal of Potassium Cl

2. Action of Alcoholic KOH : (Formation of Alkene).

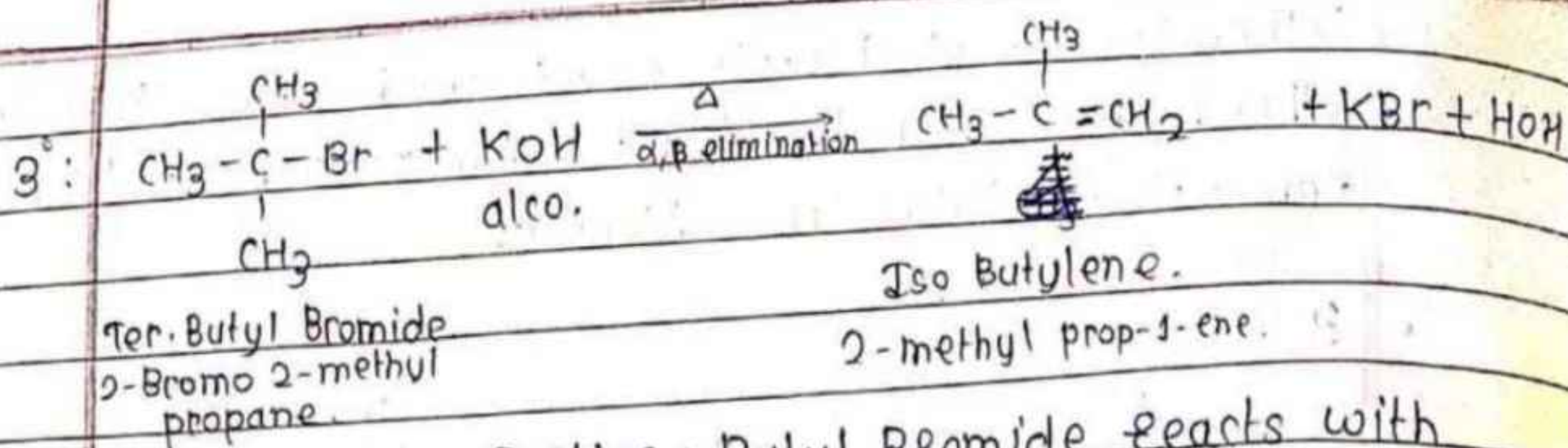


When Ethyl Bromide reacts ^{with} alcoholic ~~the~~ Potassium hydroxide to form Ethene with Potassium Bromide and water removal.



When Iso-propyl Bromide reacts with alcoholic Potassium hydroxide to form Propene with removal of Potassium Bromide and water.

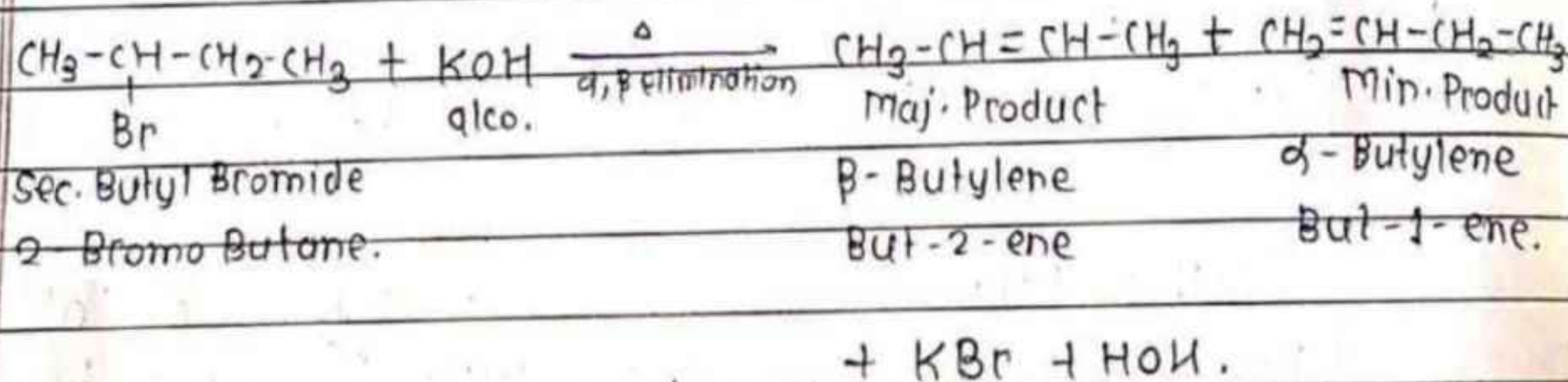
Note: Elimination मध्ये Alkene तयार होतो.



When Tertiary Butyl Bromide reacts with alcoholic Potassium hydroxide to form Iso-Butylene with removal of Potassium Bromide and water.

• Saytzeff's Rule:

The dehydrohalogenation of alkyl halide in which elimination β 'H' atom of such 'c' atom having less no. of 'H' atom.



When Secondary Butyl Bromide reacts with alcoholic Potassium hydroxide in of α and β elimination to form But-2-ene as a major product and But-1-ene as minor product with removal of Potassium Bromide and water.

3. Action of alco. KCN:

[Note] F.G $\rightarrow$ $-\text{CN}$ or $-\text{C}\equiv\text{N}$

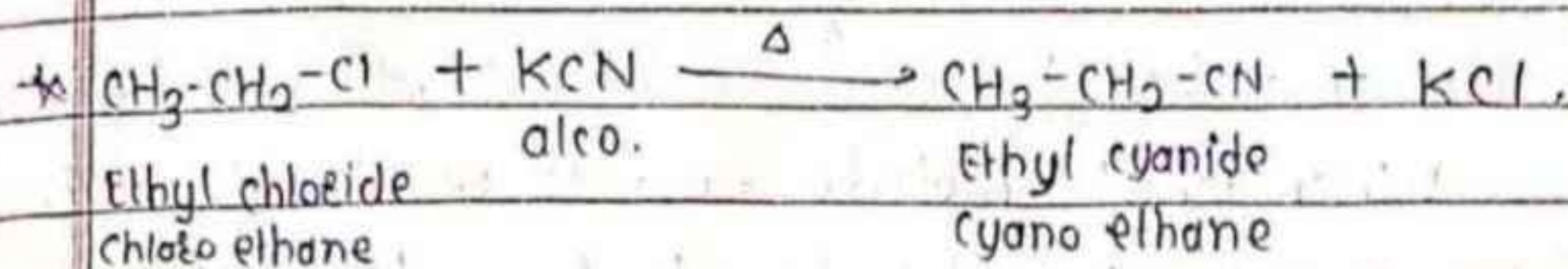
Prefix: cyano Suffix: Nitrile.

$\text{CH}_3 - \text{C}\equiv\text{N}$: C.N = Methyl cyanide

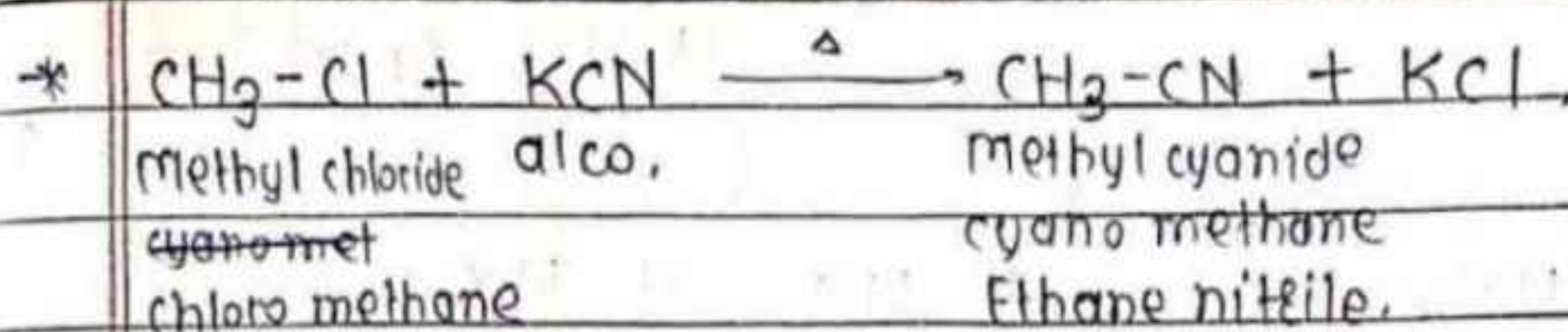
I.N = Cyano methane

Ethane Nitrile]

Note: 'Acet' हे चार शब्द फक्त '2' carbon चा Alkane साठी.

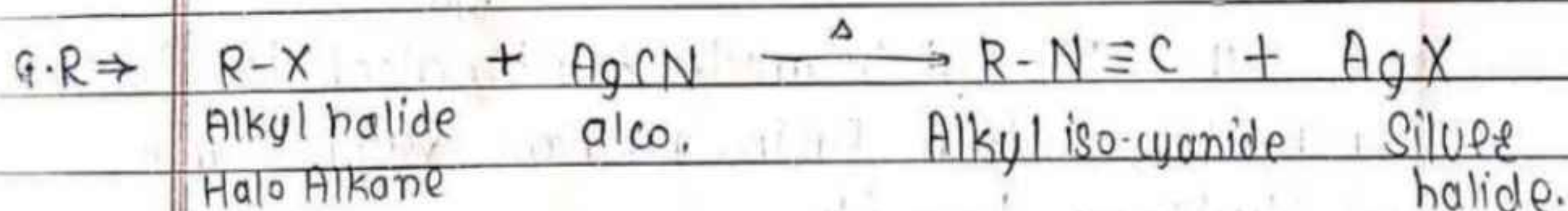


When Chloro Ethane reacts with alcoholic Potassium cyanide on heating to form Cyano Ethane with removal of Potassium Chloride.



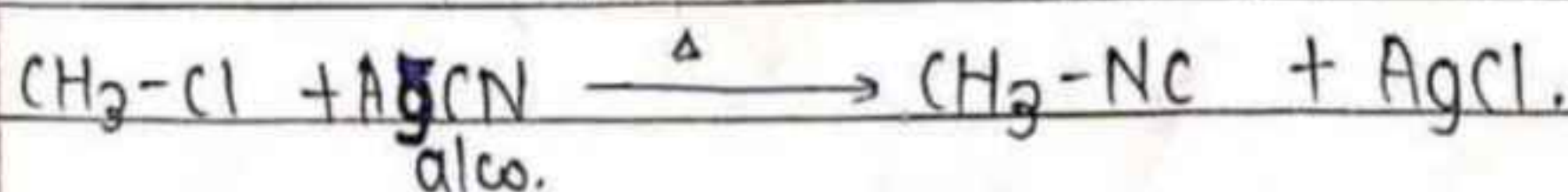
When Methyl chloride reacts with alco. Potassium cyanide on heating to form Ethane nitrile / Acetanitrile with removal of Potassium Chloride.

4. Action of alco. AgCN : [Formation of Isocyanide]

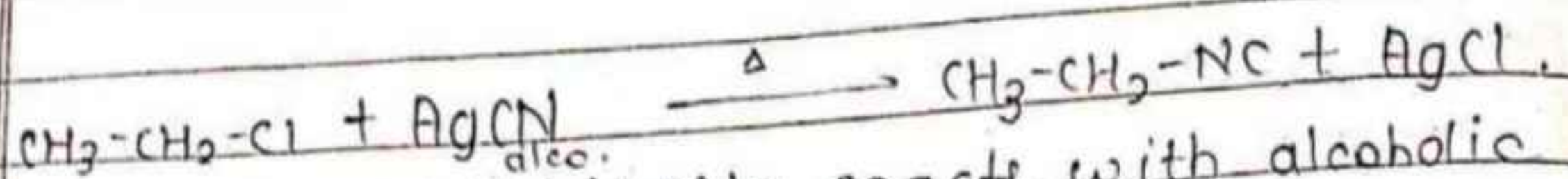


When Alkyl halide reacts with alcoholic Silver cyanide on heating to form Alkyl iso-cyanide with removal of silver halide.

Q. What happen when alco. AgCN on:



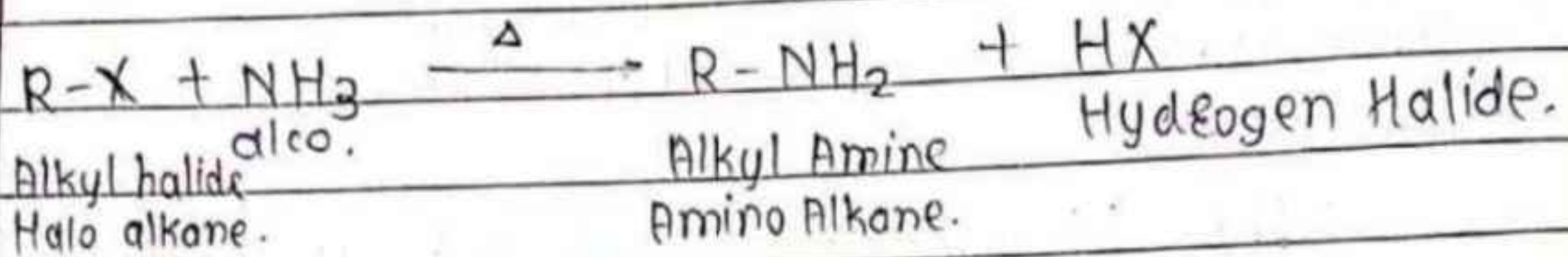
When Methyl chloride reacts with alcoholic Silver cyanide on heating to form Methyl isocyanide with removal of Silver chloride.



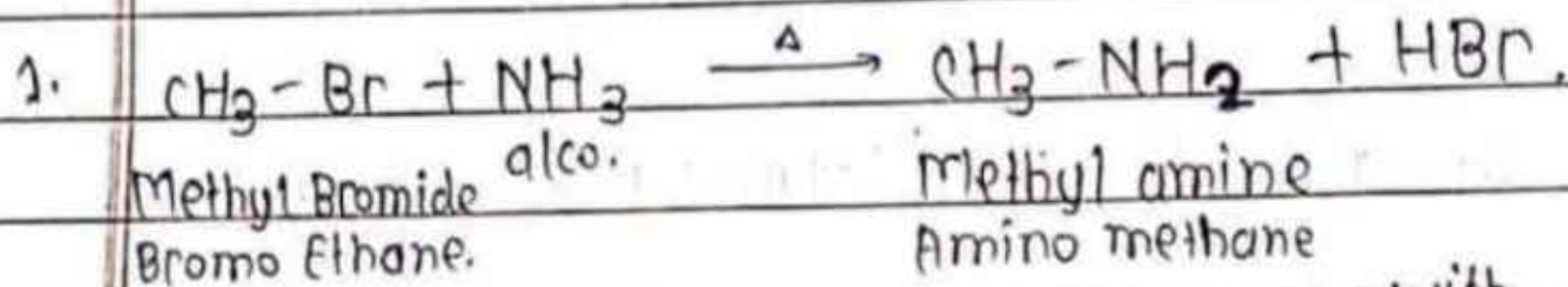
When Ethyl chloride reacts with alcoholic silver cyanide on heating to form Ethyl isocyanide with removal of silver chloride.

5. Action of alco. NH_3 : [Note: Amine - NH_2
Prefix : Amino Suffix : Amine]
Replace 'e'

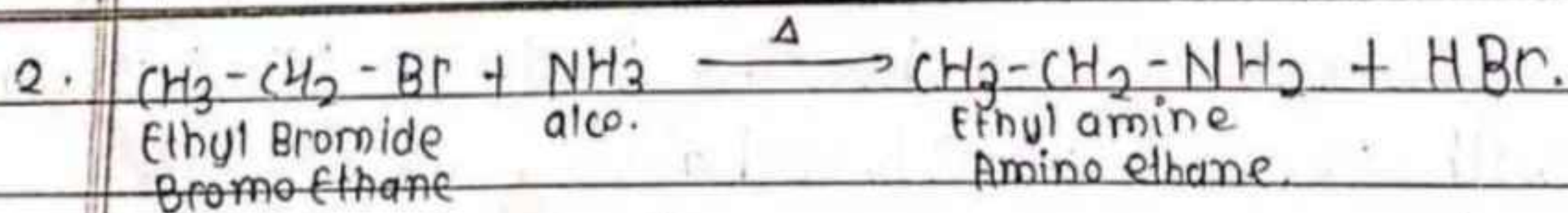
G.R
⇒



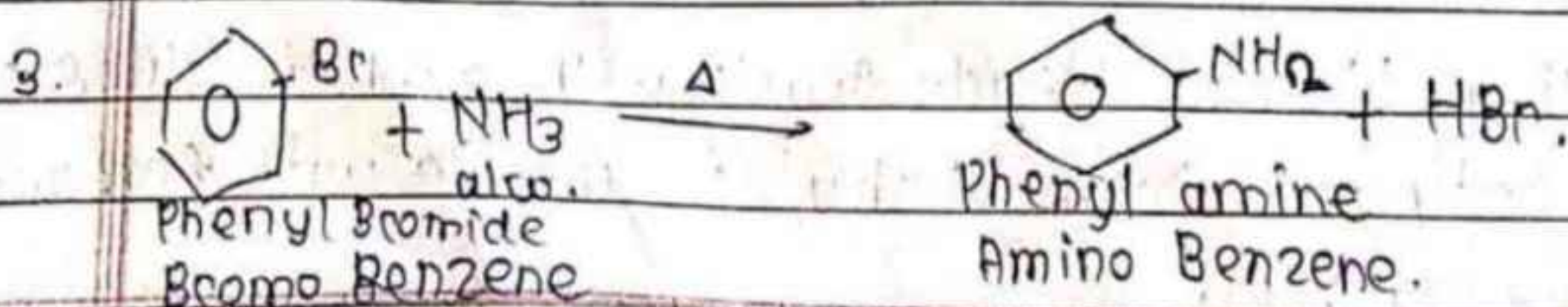
* Complete the reaction:



When Methyl Bromide reacts with alcoholic Ammonia on heating to form Amino methane with removal of Hydrogen Bromide.



When Bromo Ethane reacts with alcoholic Ammonia on heating to form Amino ethane with removal of Hydrogen Bromide.



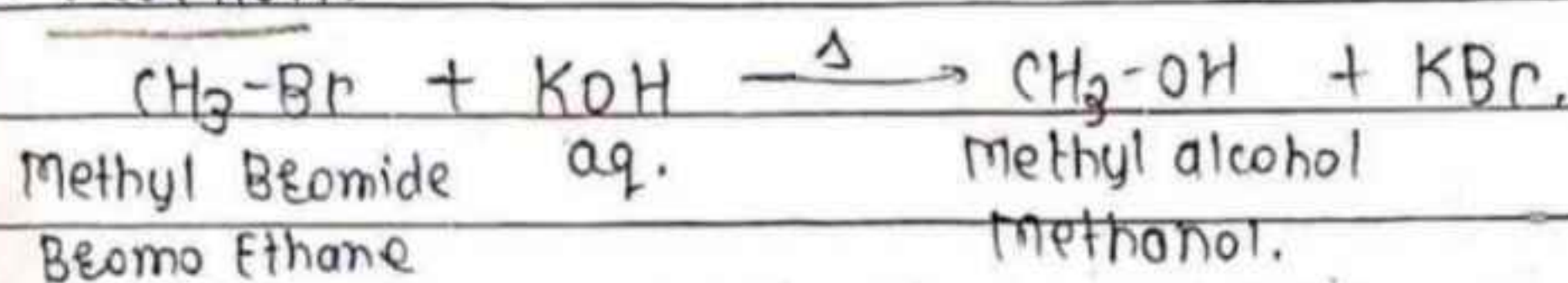
When Phenyl Beomide reacts alcoholic ammonia on heating to form Amino Benzene with removal of Hydrogen Beomide.

Q.1 Explain alkaline hydrolysis of Methyl Beomide?

Q.2 Explain S_N2 reaction Mechanism?

⇒ @Defⁿ: The Bimolecular Nucleophilic Substitution reaction is called S_N2 reaction Mechanism.

(b) Reaction:



When Methyl Beomide reacts with aqueous Potassium hydroxide on heating to form Methanol with removal of Potassium Beomide.

(c) Chemical Kinetics: The rate of reaction is directly proportional to active mass of concentration of ^{both} reactant.

$$R \propto [\text{CH}_3\text{Br}] [\text{OH}]$$

$$R = K [\text{CH}_3\text{Br}] [\text{OH}]$$

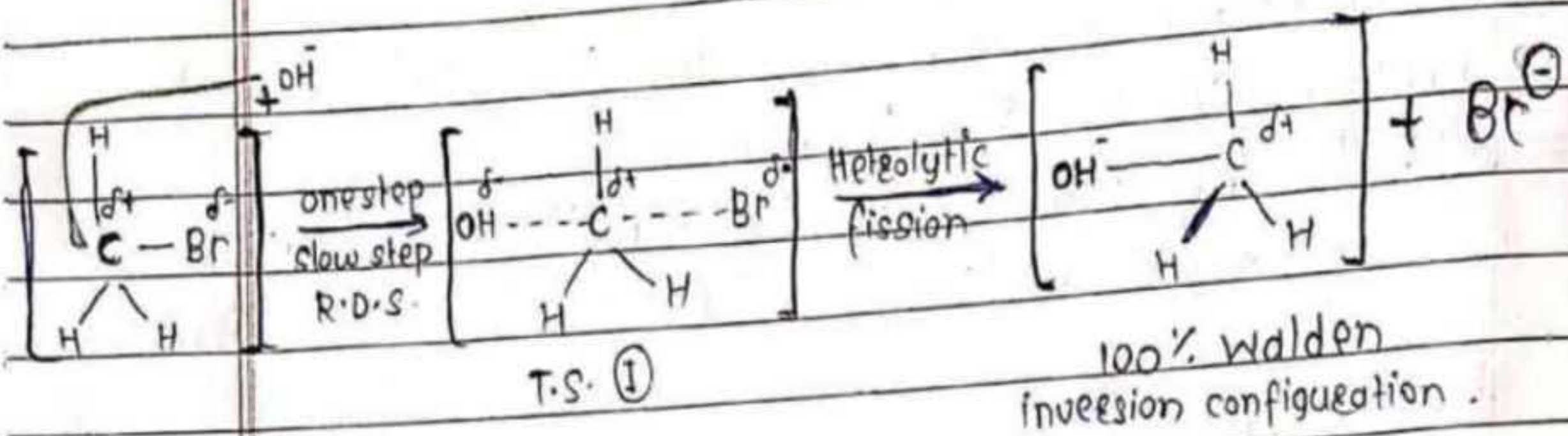
where, K is proportionality constant

(d) Mechanism:

- i) It is a only step, ^{slow step & Rate Determining step} reaction using non-polar ^{solvent}.
- ii) The formation and breaking of bond simultaneously process.
- iii) The hydroxy group is attached to Back side attack (BSA). Then five atom directly attach to central 'C' atom is called Transition state [T.S.].

Note: Heterolically $\frac{\text{break}}{\text{same}}$ atom
Homolically $\frac{\text{break}}{\text{same}}$ atom.

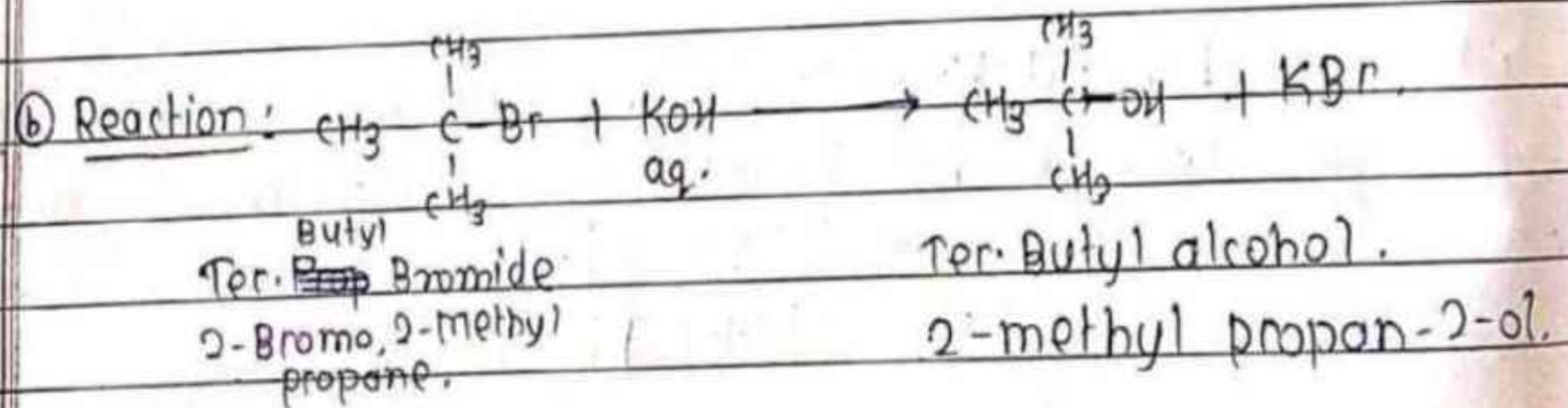
- iv) Finally C-Br bond is heterolically break to form 100% Walden inversion configuration.
v) S_N2 reaction mechanism only Backside attack is possible.



Q.1 Explain S_N1 reaction mechanism.

Q.2 Explain alkaline hydrolysis of Ter. Butyl Bromide?

⇒ @Defⁿ:- The ^{uni}molecular Nucleophilic Substitution reaction is called S_N1 reaction mechanism.



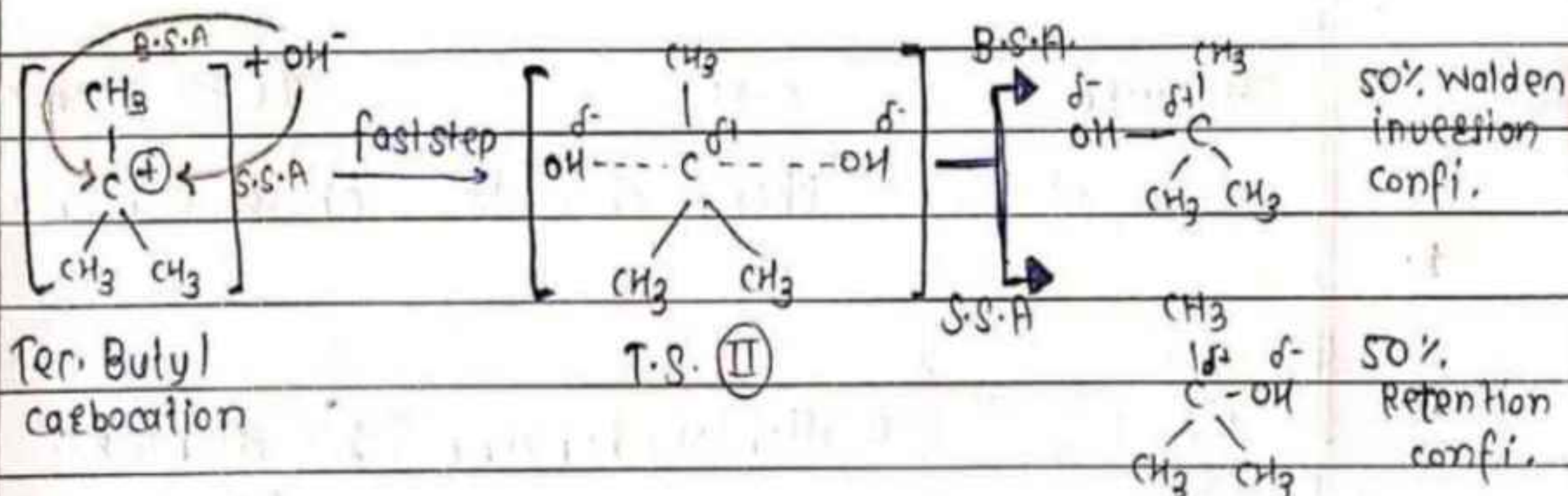
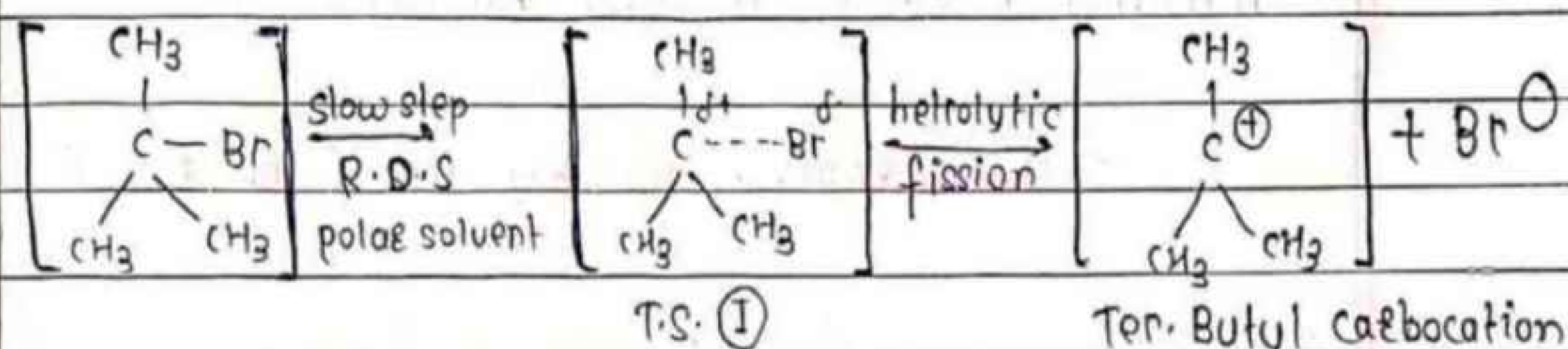
⑦ Chemical Kinetics: The rate of ~~ratio~~ reaction is directly proportional to active mass of concentration of one reaction.

$$R \propto [\text{C}(\text{CH}_3)_3\text{Br}]$$

$$R = K[\text{C}(\text{CH}_3)_3\text{Br}]$$

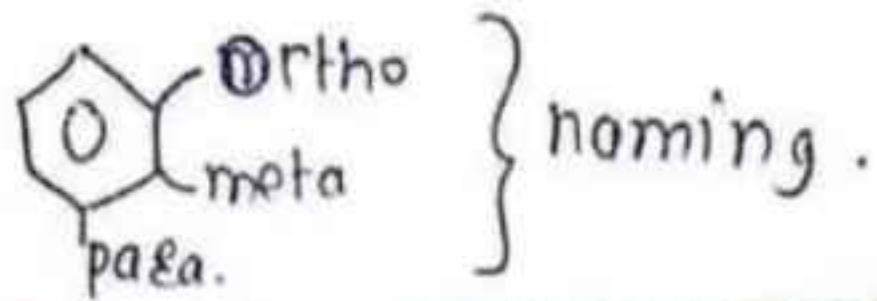
where, K is proportionality constant.

- d) Mechanism: i) It is a two step reaction.
 ii) 1st step is a slow step R.D.S. by using polar solvent to form Transition State.
 iii) C-Br bond is heterolytically break to form Ter. Butyl carbocation (same side attack)
 iv) Second step is a fast step reaction.
 v) The 'OH' group is attached to B.S.A. also S.S.A. Then finally B.S.A. produces 50% Walden inversion configuration & S.S.A. produces 50% Retention confi.

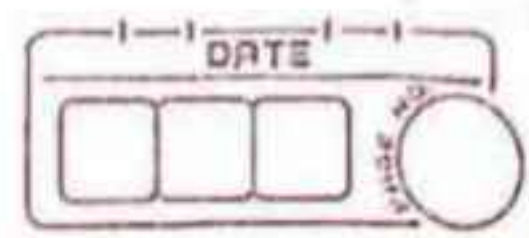


Q. What is the difference between SN_2 & SN_1 reaction?

Sr. No.	Properties	SN_2	SN_1
1.	Defn	The Bimolecular Nucleophilic Substitution Reaction.	The Unimolecular Nucleophilic Substitution Reaction.
2.	Chemical Kinetics	Rate of reaction directly prop. to both reactant	Rate of reaction directly prop. to one reactant.
3.	step	One step	Two step.
4.	T.S.	Only one	Two.
5.	Order of reaction	Second	First.



} naming.



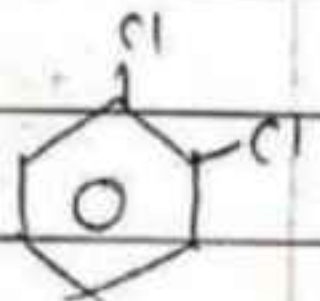
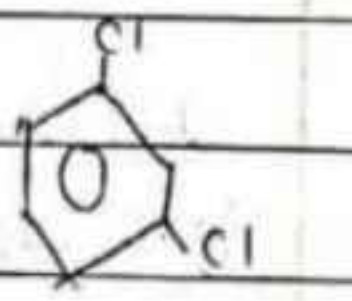
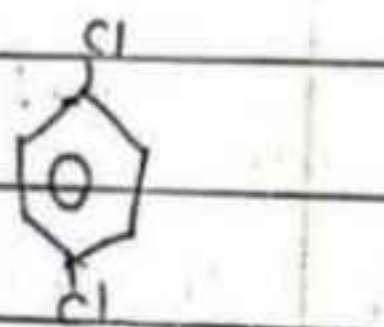
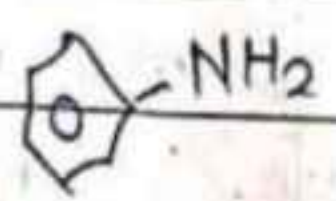
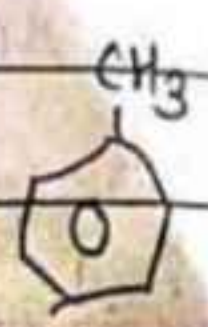
6.	Solvent	non-polar solvent	polar solvent
7.	possible attack	B.S.A	B.S.A & S.S.A.
8.	order of reaction.	$3^\circ > 2^\circ > 1^\circ$	$1^\circ > 2^\circ > 3^\circ$

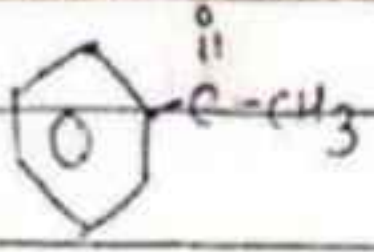
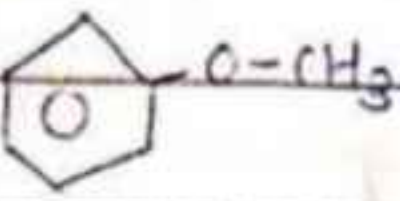
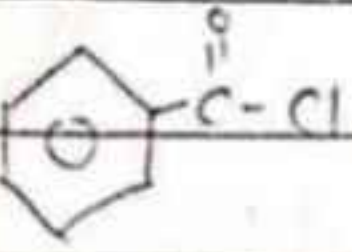
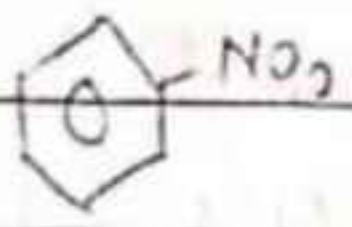
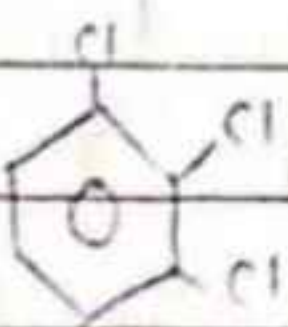
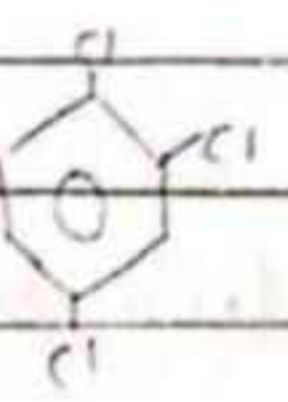
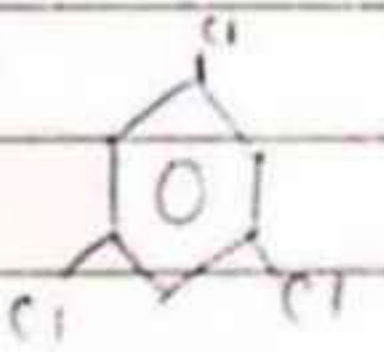
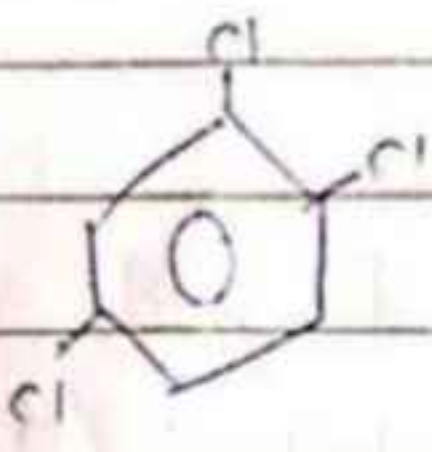
Arene :-

- Aryl halide - (Halo Benzene):

* The halogen derivative of aromatic compound is called as Aryl halide.

* It is represented by Ar-X or ph-X

Sr. No.	Structure	C.N.	IUPAC name.
1.		Phenyl chloride	chloro Benzene
2.		o-dichloro benzene	1,2-dichloro Benzene
3.		m-dichloro benzene	1,3-dichloro Benzene
4.		p-dichloro benzene	1,4-Dichloro Benzene
5.		phenyl amine	Amino Benzene: S.N : Aniline
6.		Methyl Benzene	S.N : Toluene.

7.		Methyl Phenyl Ketone	S.N : Acetophenon.
8.		Methyl phenyl ether	Methoxy Benzene S.N : Anisole.
9.		-	Benzoyl chloride
10.		-	Nitro Benzene.
11.		-	1,2,3 - Trichloro Benzene
12.		-	1,2,4 - Trichloro Benzene.
13.		Symmetrical Tri- chloro Benzene.	1,3,5 - Trichloro Benzene.
14.		-	1,2,5 1,2,4 - Trichloro Benzene.

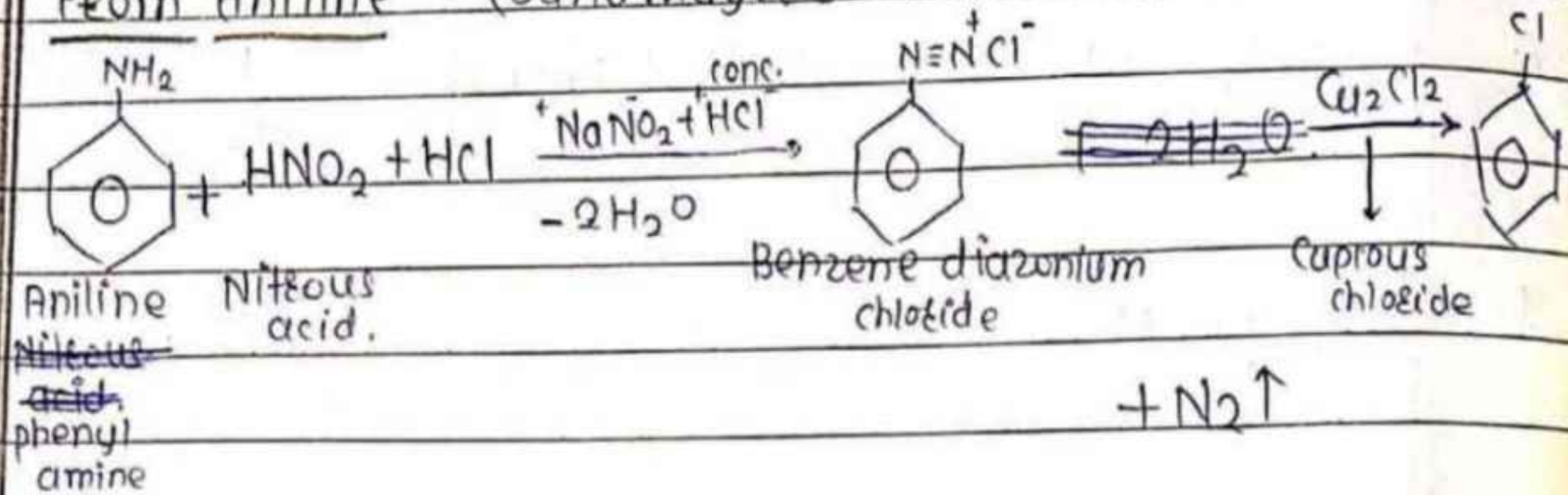
Note: From Aniline reaction मध्ये catalyst पाश्चिमी reactant तैयार होतो.

DATE

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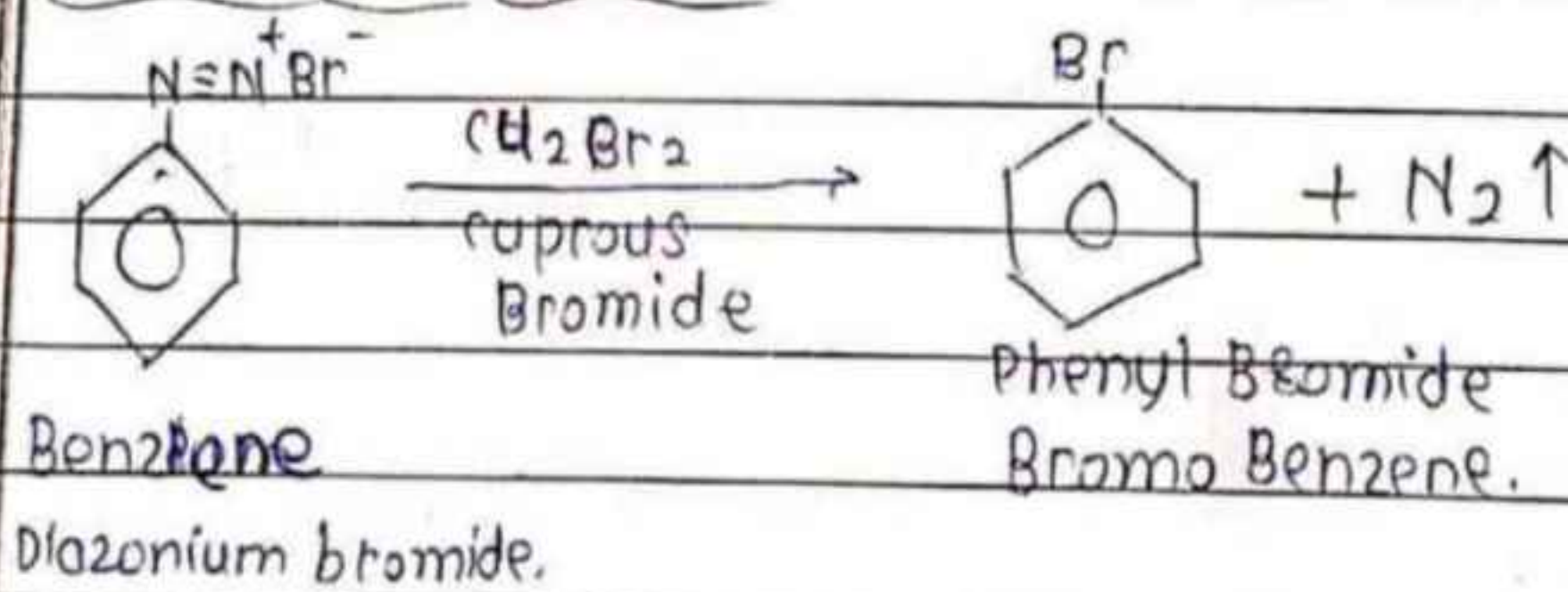
• Methods Of Preparation Of Aryl Halide:

1. From Aniline - (Sandmeyer's Reaction)



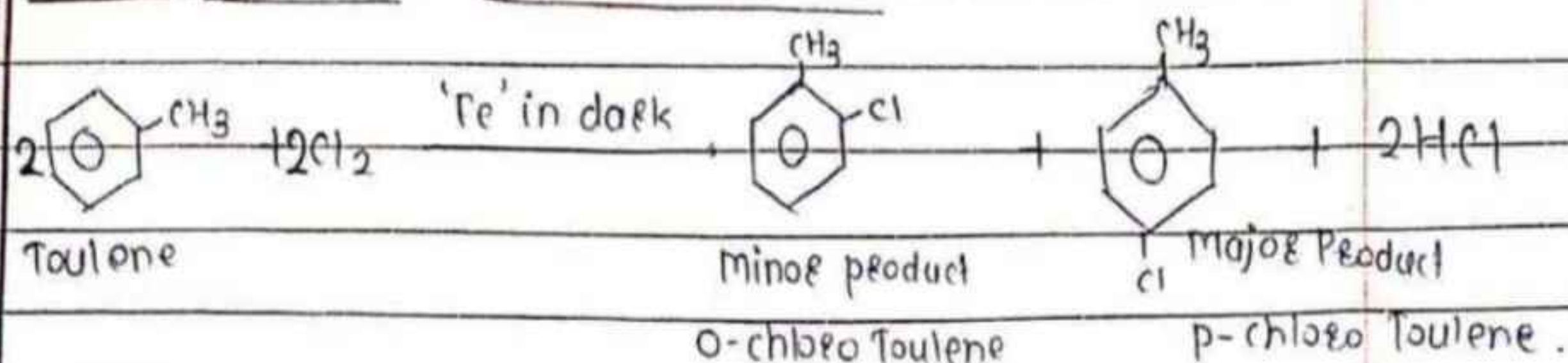
When Aniline reacts with Nitrous acid and concentrated Hydrochloric acid in presence Sodium Nitrite and concentrated Hydrochloric acid to form Benzene diazonium chloride with removal of water and again reacts with Cuprous chloride to form Aryl chloride with removal of Nitrogen gas.

2. How will you prepare Phenyl Bromide from Benzene Diazonium bromide?



When Benzene Diazonium bromide reacts with Cuprous Bromide to Bromo Benzene / Phenyl Bromide with removal of Nitrogen gas.

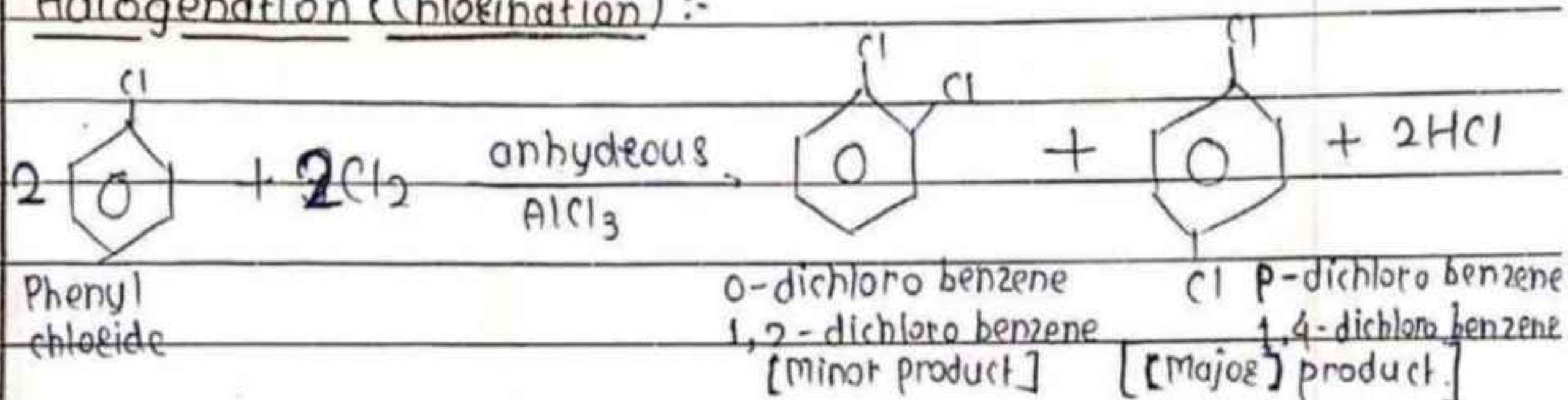
2. From Toulene - (Chloination)



When Toulene reacts with chlorine in presence of Iron in dark to form O-chloro Toulene as minor product and p-chloro Toulene as major product with Hydrochloric acid's removal.

• Reactions Of Aryl Halide :-

1. Halogenation (Chloination) :-

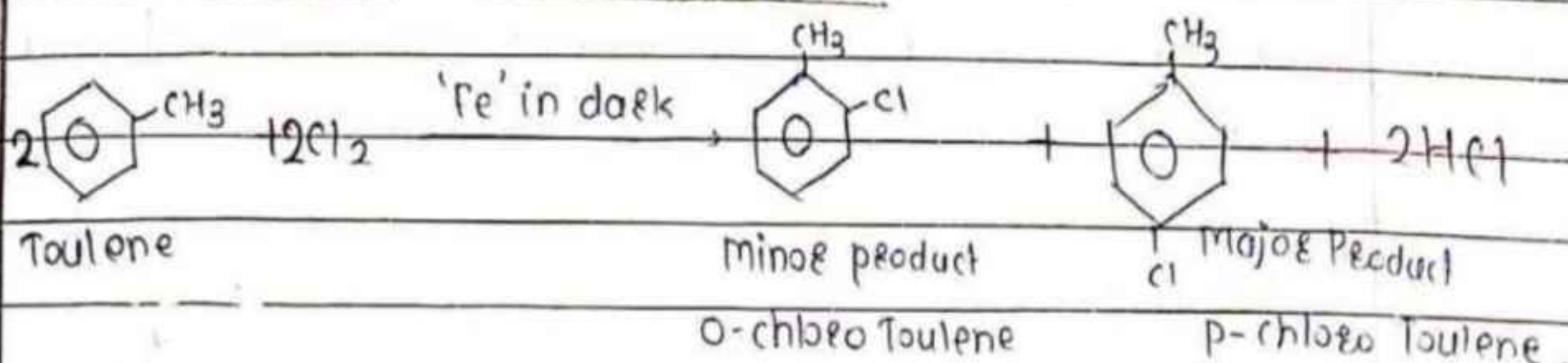


When Phenyl chloride reacts with chlorine in presence of anhydrous aluminium chloride to form O-dichloro benzene as minor product and p-dichloro benzene as major product with removal of Hydrochloric acid.

2. Nitration :

[It is a mixture of Nitric acid and Sulphuric acid i.e. $\text{HNO}_3 + \text{H}_2\text{SO}_4$ as 1:3 proportion].

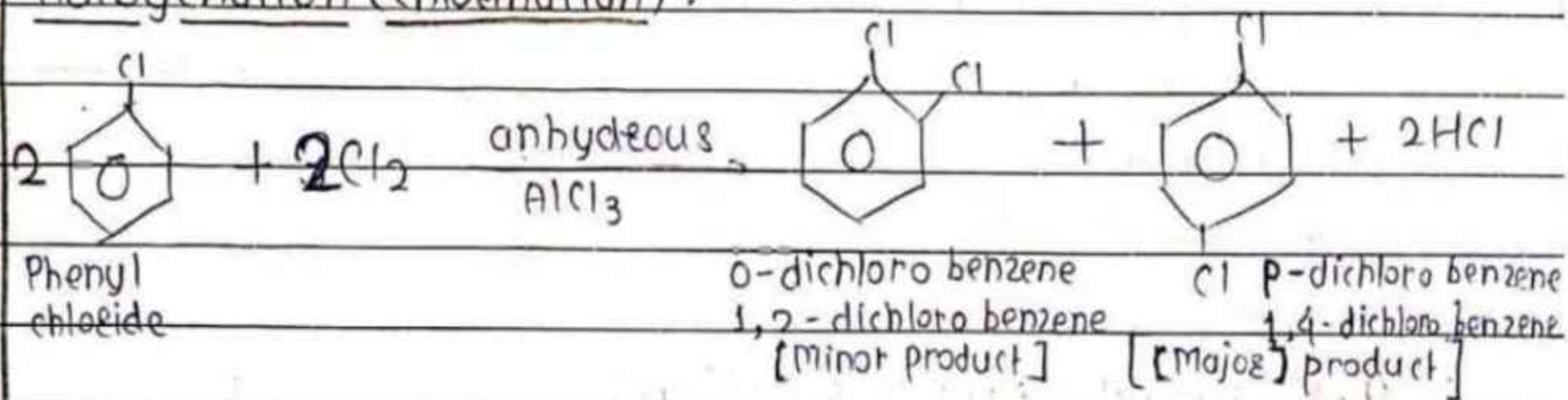
2. From Toulene - (Chlorination)



When Toulene reacts with chlorine in presence of Iron in ~~dark~~ dark to form o-chloro Toulene as minor product and p-chloro Toulene as major product with Hydrochloric acid's removal.

• Reactions Of Acyl Halide :-

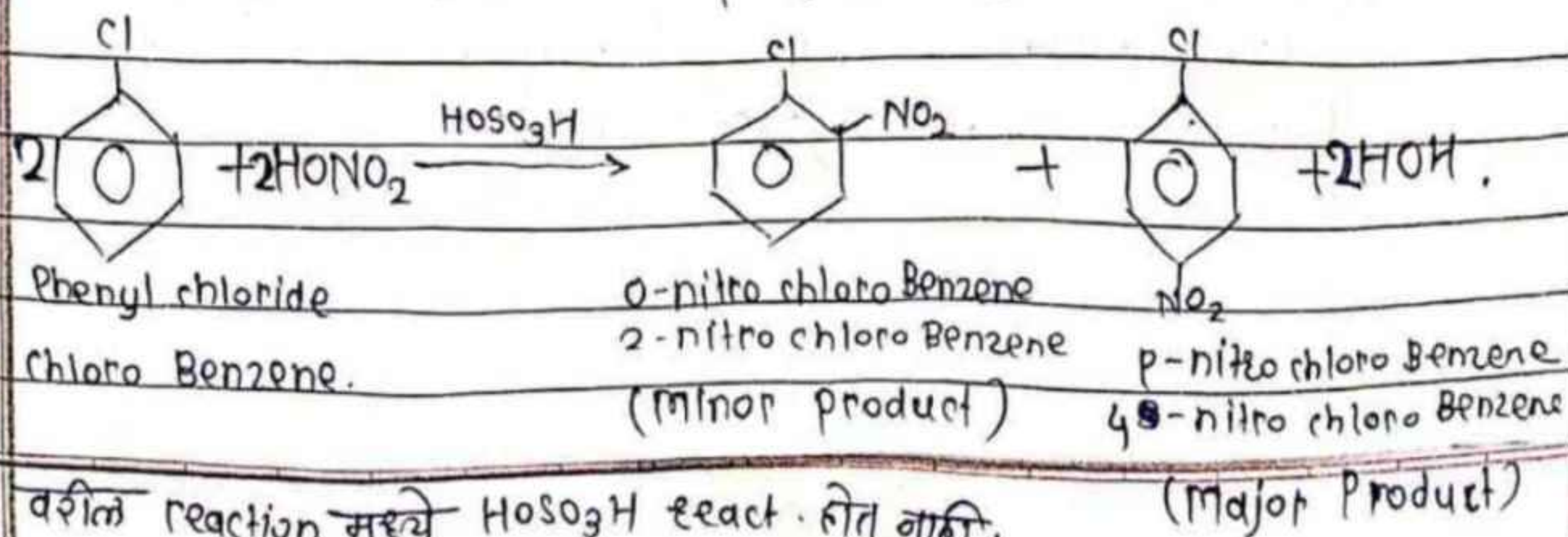
1. Halogenation (Chlorination) :-



When Phenyl chloride reacts with chlorine in presence of anhydrous aluminium chloride to form o-dichloro benzene as minor product and p-dichloro benzene as major product with removal of Hydrochloric acid.

2. Nitration :

[It is a mixture of Nitric acid and Sulphuric acid i.e. $\text{HNO}_3 + \text{H}_2\text{SO}_4$ as 1:3 proportion].

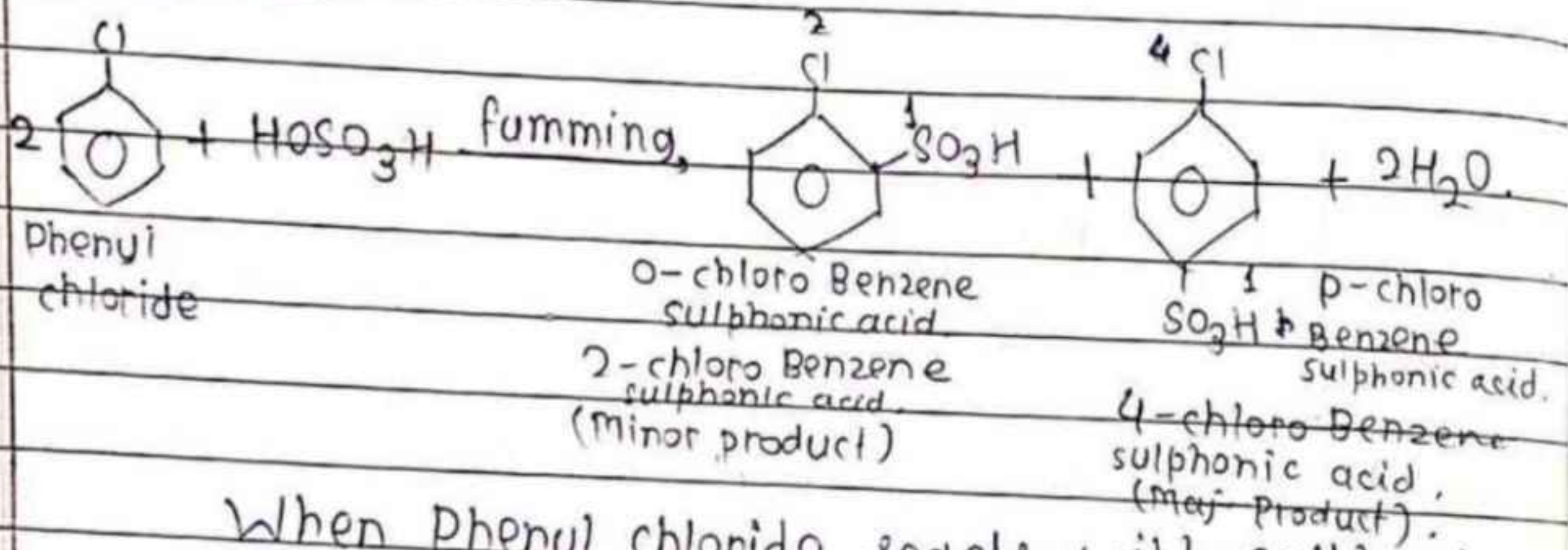


Note:

वरील reaction मध्ये HOSO_3H react होत नाही.

When Phenyl chloride reacts with nitrating mixture also with sulphuric acid and forms o-nitro chloro benzene as minor product and p-nitro chloro benzene as major product with removal of water.

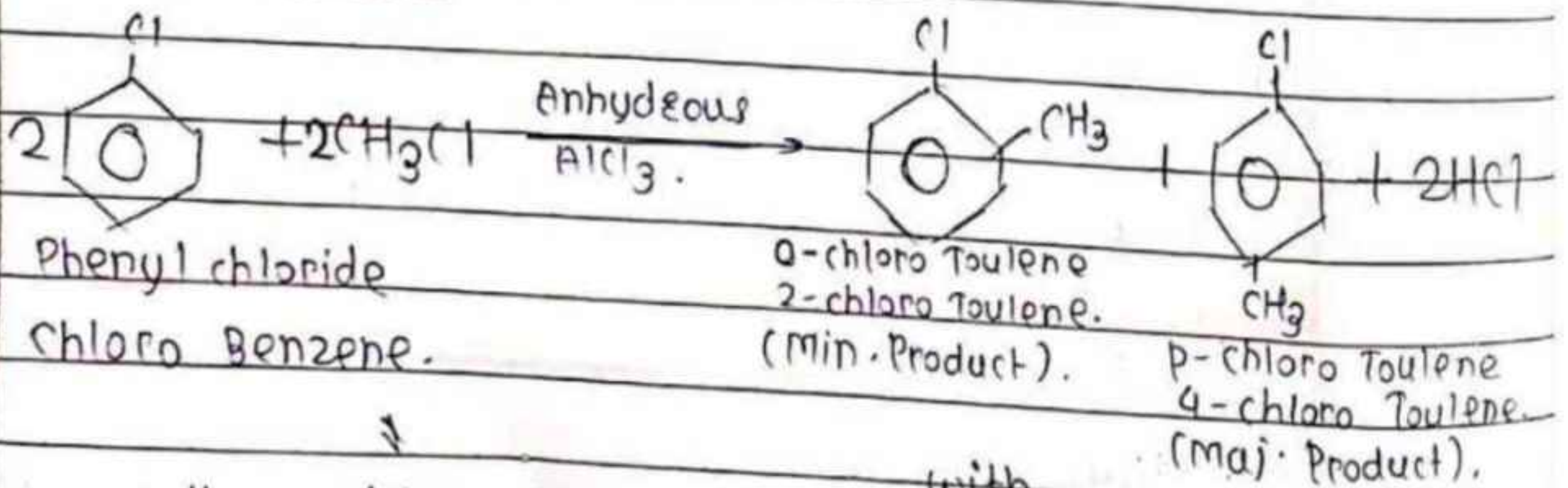
3. Sulphonation :-



When Phenyl chloride reacts with sulphuric acid in condition of fumming to form o-chloro Benzene Sulphonic acid as minor product and p-chloro Benzene Sulphonic acid as major product.

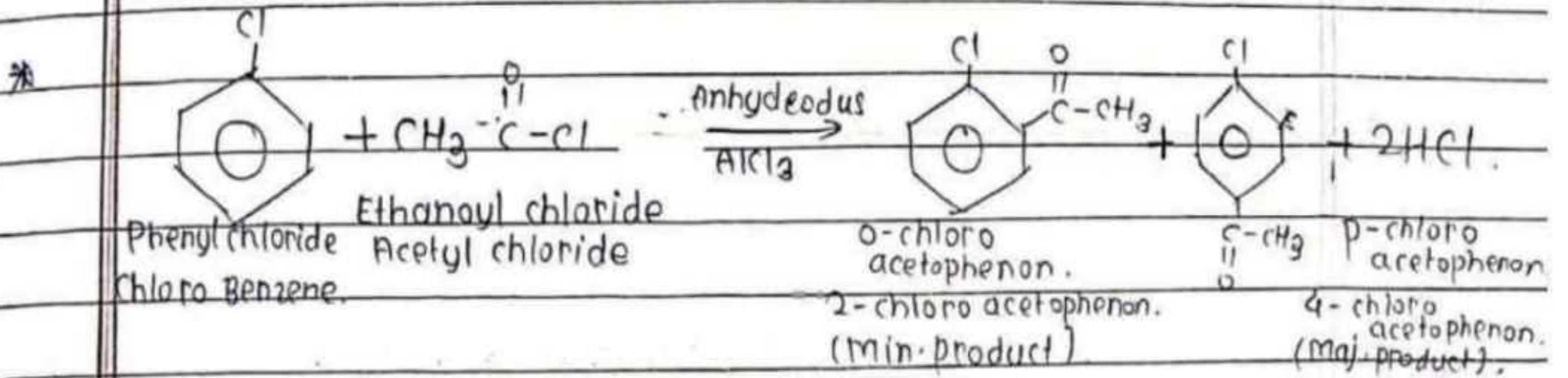
4. Friedel Crafts's reaction :-

a) Alkylation :-

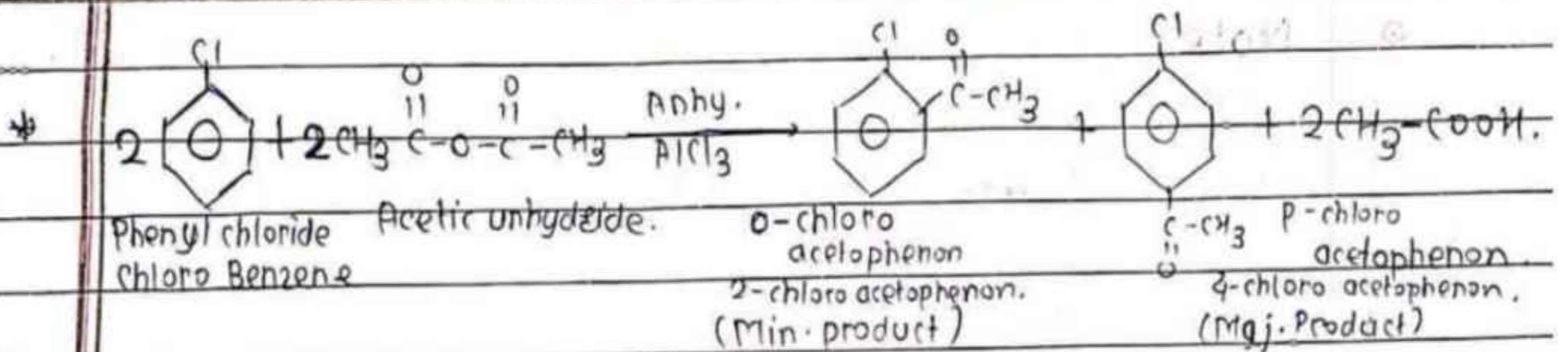


When Chloro Benzene reacts with methyl chloride in presence of Anhydrous Aluminium Chloride to form o-chloro Toulene as minor product and p-chloro Toulene as major product.

b) Acylation: [F.G = $-\overset{\overset{\text{O}}{\parallel}}{\text{C}}-\text{Cl}$ Eg. $\text{CH}_3-\overset{\overset{\text{O}}{\parallel}}{\text{C}}-\text{Cl}$.
Methanoyl chloride / Acetyl chloride]



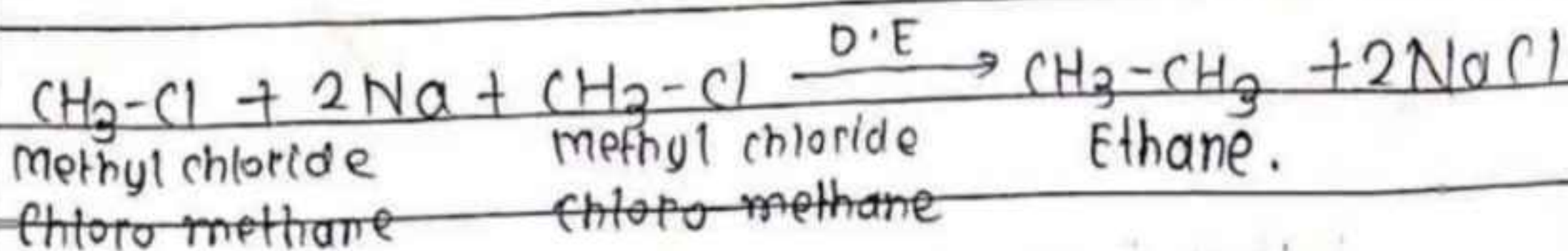
When Phenyl chloride reacts with Acetyl chloride in presence of Anhydrous.



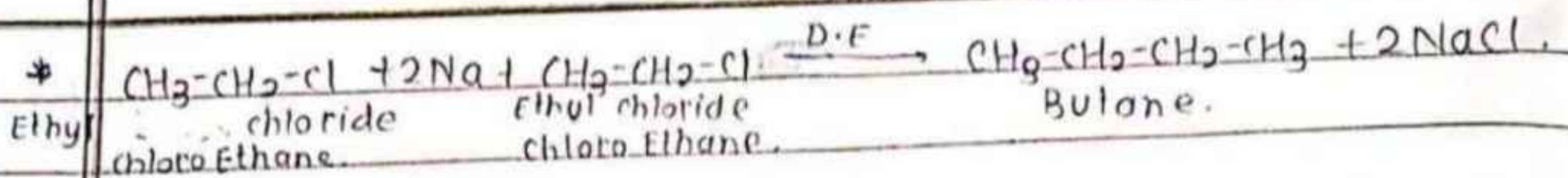
When Phenyl chloride reacts with Acetic anhydride in presence of Anhydrous Aluminium Chloride o-chloroacetophenone as minor product and p-chloroacetophenone as Major Product with removal of Ethanoic acid.

* Wurtz synthesis:- [Note: i] In this reaction 'CH₄' can be not prepared.
ii] $\text{R-X} + 2\text{Na} + \text{R-X} \xrightarrow{\text{D.E.}} \text{R-R} + 2\text{NaX}$]

* How will you prepare Ethane & Butane from alkyl halide by the action 'Na' metal?

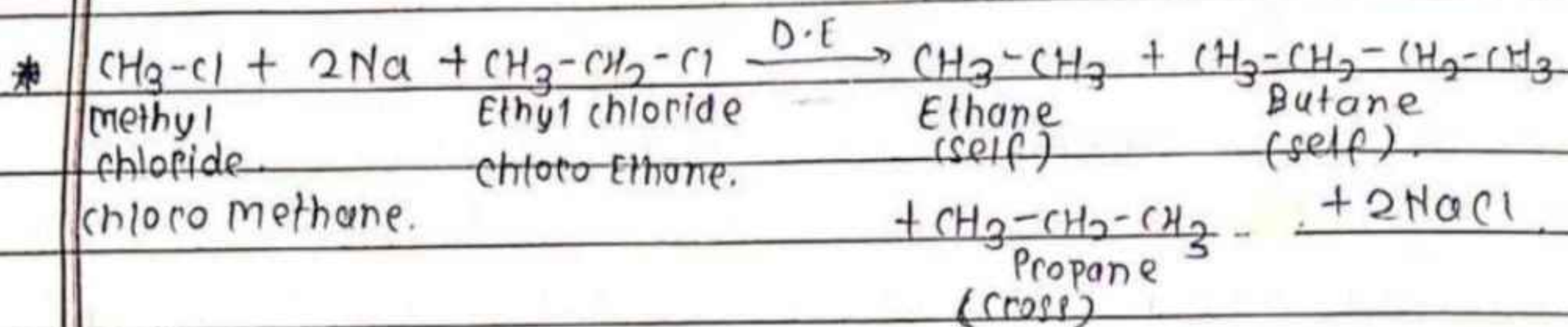


When Methyl chloride reacts with Sodium metal in presence of Dry Ether to form Ethane with removal of sodium chloride.

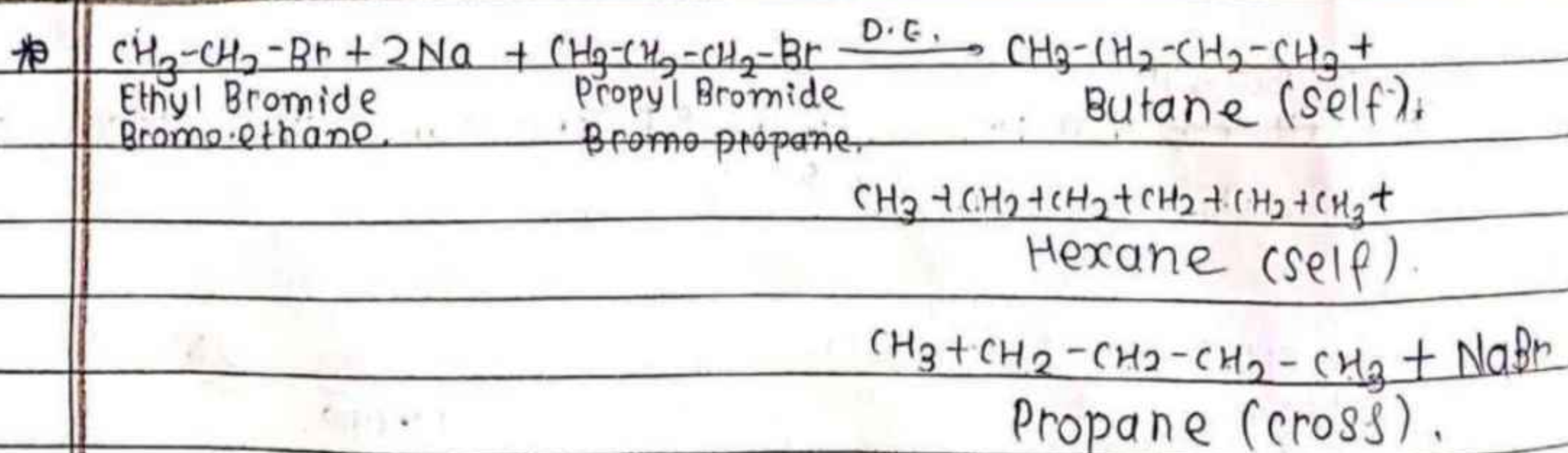


When chloro Ethane reacts with Sodium metal in presence of Dry Ether to form Butane with removal of sodium chloride.

- **Note:-** If different no. of alkyl halide reacts with 'Na' metal to form different no. of alkanes are produced ; 2 self + 1 cross alkane.

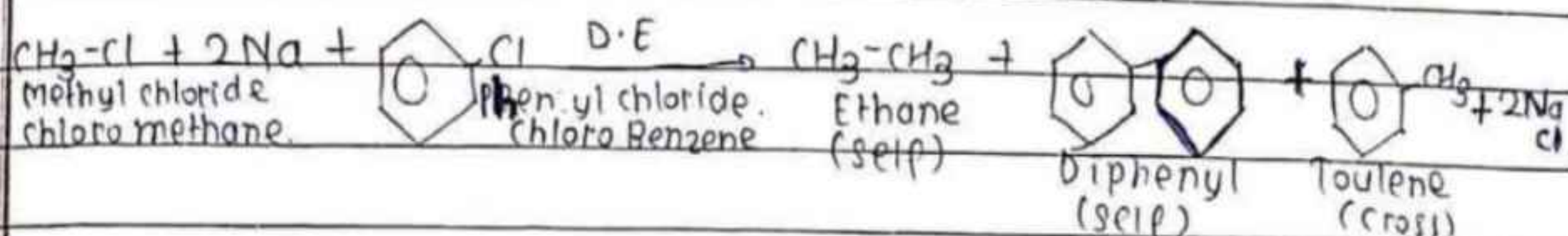
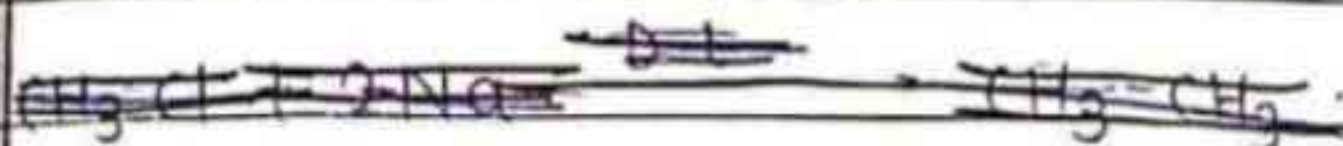


When chloro methane and Ethyl chloride reacts with sodium metal in presence of Dry ether to form Ethane & Butane as self product and Propane as cross product with removal of sodium chloride.



When Bromo Ethane reacts with Sodium metal and propyl Bromide in presence of Dry Ether to form Butane and Hexane as self product and Propane as cross product with removal of sodium bromide.

* Wuertz - fitting Reaction:



When Chloro methane and Benzyl chloride reacts with sodium metal in presence of Ethane and Diphenyl as self product and Toluene as cross product with removal of Sodium Chloride.

• Uses and Environmental effects of some Polyhalogen Compounds :-

1. Dichloromethane / methylene chloride (CH_2Cl_2) :-

- a) It is colourless volatile liquid.
- b) It is used as a solvent, and used as propellant in aerosols.
- c) It is high dangerous if it comes in contact with eyes.
- d) Over exposure to dichloromethane causes headaches, numbness, weakness etc.

2. Chloroform / Trichloromethane:

- a) It is colourless liquid with sweet smell.
- b) It is used as solvent for extraction of natural products like gums, fats, resins.
- c) Long exposure to chloroform may affect liver.
- d) Chloroform when exposed to air and light forms a poisonous compound phosgene so it is stored in dark coloured air tight bottles.

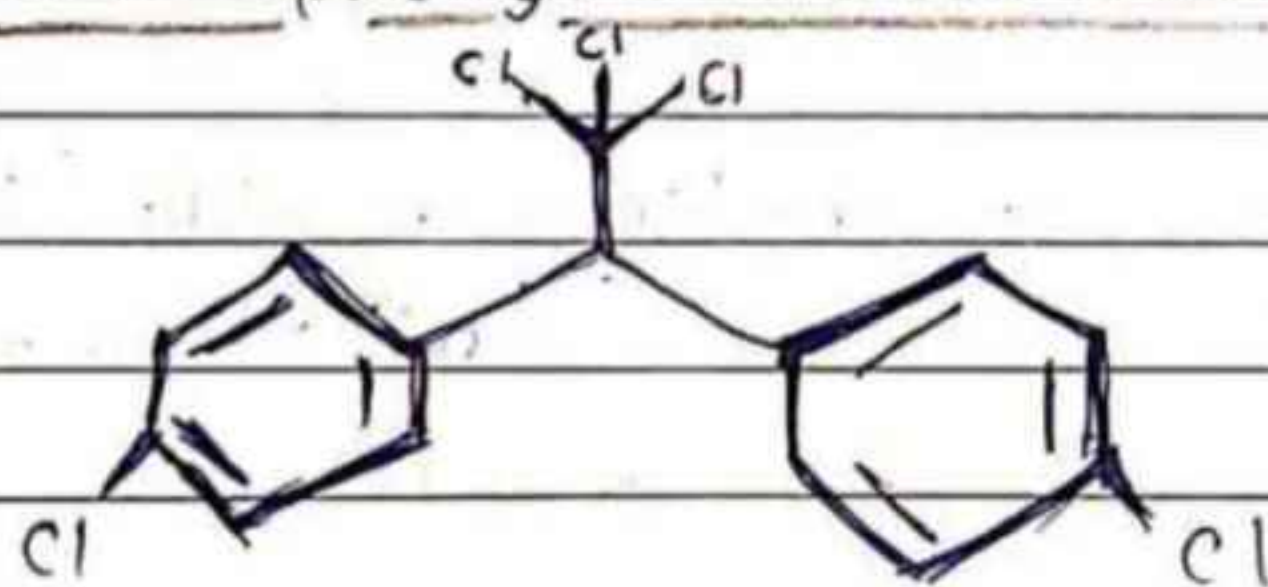
3. Carbon Tetrachloride / Tetrachloromethane (CCl_4):-

- ⇒
- a) It is colourless liquid with sweet smell.
 - b) It is very useful solvent for oils, fats, resins.
 - c) It is used as cleaning agent.
 - d) It is a green house gas.
 - e) It is highly toxic to liver.

4. Iodoform or Triiodomethane (CHI_3):

- ⇒
- a) It is a yellow crystalline substance with disagreeable smell.
 - b) It used in medicine.
 - c) It causes breathing difficulty.
 - d) It causes irritation to skin and eyes.

5. Dichlorodiphenyl trichloroethane (DDT):



- a) It is colourless, tasteless and odourless crystalline compound.
- b) It kills insects like houseflies, bodylice & mosquitoes.
- c) High dose of DDT causes vomiting, shakiness etc.
- d) DDT is a persistent organic pollutant, readily absorbed in soils and tends to accumulate in ecosystem.