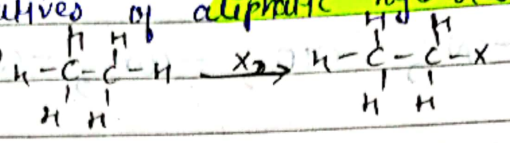
Class 12th

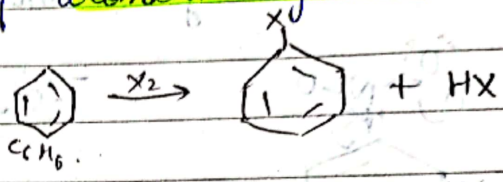
Page No.
Date

Haloalkanes and Haloarenes

* The halogen derivatives of aliphatic hydrocarbons are called "haloalkanes".

eg: 

* The halogen derivatives of aromatic hydrocarbons are called as haloarenes.
  → Benzene.

eg: 

* Haloalkanes are also known as "Alkyl halide".

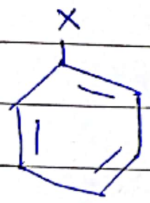
$R-X$ → F, Cl, Br, I

↓

C_nH_{2n+1}

eg: C_2H_5-Cl , C_3H_7-Br.

* Haloarenes are also known as "Aryl halide".



X = F, Cl, I, Br

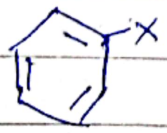
* Classification.

On the basis of no. of Halogen atoms.

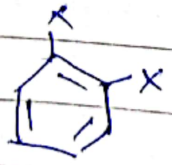
C_2H_5X
Monohaloalkane

$X-CH_2-CH_2X$
Dihaloalkane

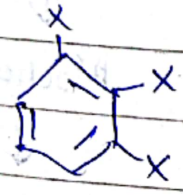
$CH_2X-CHX-CH_2X$
Trihaloalkane.



Monohaloarene



Dihaloarene

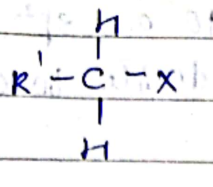


Trihaloarene.

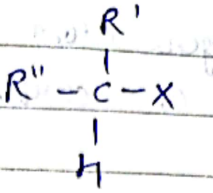
On the Basis of Compounds containing sp^3 C–X Bond.

⇒ Monohalogen.

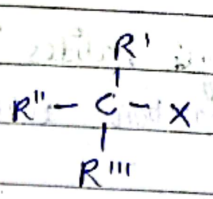
(a) Alkyl halides or haloalkanes [R–X]



1° Alkyl halide



2° Alkylhalide



3° Alkyl halide

⇒ Dihalogen. (एक ही carbon से Halogen atom जुड़े हो।)

Geminal dihalide = Halogen atoms are attached to same carbon atom. These are kla "alkylidine dihalides".

eg: $CH_3-\underset{Cl}{\underset{|}{CH}}-Cl$

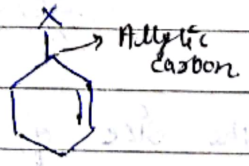
Vicinal dihalide = Halogen atom are attached to adjacent carbon atoms. These are kla "alkylene dihalides"

eg: $\underset{Cl}{\underset{|}{CH_2}}-\underset{Cl}{\underset{|}{CH_2}}$

(b) Allylic halides

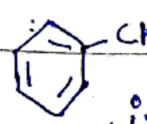
⇒ These are the compounds in which halogen is bonded to sp^3 hybridised carbon next to C–C double bond [C=C]

$CH_2=CH-CH_2-X$ (Allylic carbon)

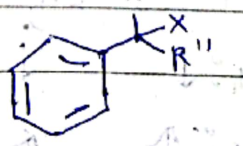


(c) Benzyl Halid [इसमें किसी carbon से halogen जुड़ा हो जो carbon Benzene से जुड़ा हो]

⇒ These are the compounds in which halogen is bonded to sp^3 hybridised carbon atom next to an aromatic ring.



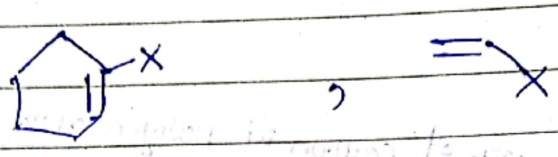
(i)



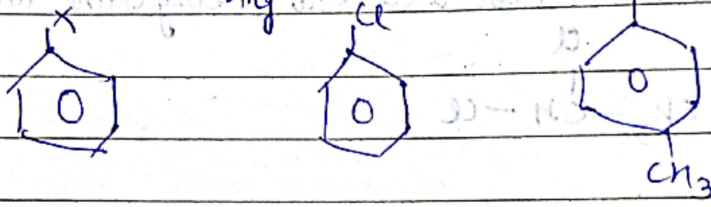
- On the basis of compounds containing sp^2 C–X bond.

a) Vinylic halides : Halogen atom is bonded to an sp^2 hybridised carbon atom of a carbon - carbon double bond [C=C]

eg: $CH_2=CH-X$, $CH_3-CH=CH-X$



b) Aryl halides : Halogen atom is directly bonded to benzene ring



4-methylchlorobenzene

* Nature of C–X Bonds.

- Halogens are more "electronegative" than carbon. So, the carbon halogen bond is a polar bond. The carbon bears a small positive charges whereas the halogen bears a partial negative charge

$$\overset{\delta+}{C}-X^{\delta-}$$

- As the size of halogen atom increases on moving down the group, the C–X bond length also increases and polarity of C–X bond decreases.

Down the group नीचे ↓ Bond length बढ़ती है और Bond enthalpy घटती है।

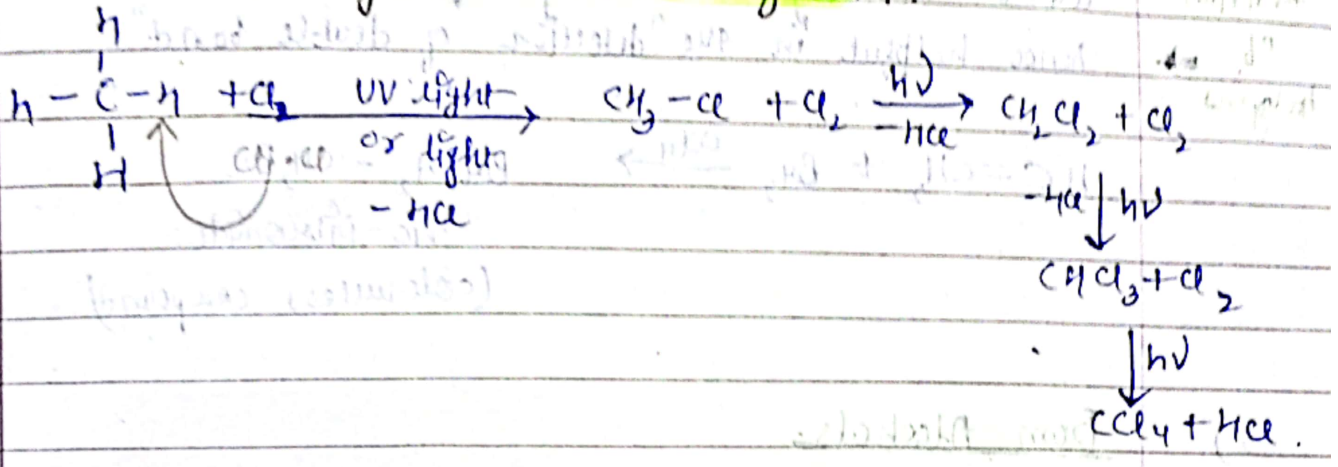
Highest Dipole moment

	CH_3-F	CH_3-Cl	CH_3-Br	CH_3-I
most electronegative	↑			
Bond length :	↓	↓	↓	↑
Bond enthalpy :	↑	↑	↑	↓

* Methods of preparation

1. From Hydrocarbons

i) From alkanes : by Free radical halogenation.



$$CH_4 + Cl_2 \xrightarrow{UV\ light\ /\ \Delta} CH_3Cl + HCl$$

$$CH_3Cl + Cl_2 \xrightarrow{h\nu} CH_2Cl_2 + HCl$$

$$CH_2Cl_2 + Cl_2 \xrightarrow{h\nu} CHCl_3 + HCl$$

$$CHCl_3 + Cl_2 \xrightarrow{h\nu} CCl_4 + HCl$$

Monohalogenation.

$$CH_4 + Cl_2 \xrightarrow{h\nu} CH_3Cl + HCl$$

$$CH_3-CH_3 + Cl_2 \xrightarrow{h\nu} CH_3-CH_2-Cl$$

1-chloro ethane

$$CH_3-CH_2-CH_3 + Cl_2 \xrightarrow{h\nu} CH_3-CH_2-CH_2-Cl + CH_3-\underset{Cl}{CH}-CH_3$$

1-chloropropane (1° minor) 2-chloropropane (2° Major)

ii) From alkenes.

⇒ Alkenes give haloalkanes by electrophilic addition of Halogen

(i) Addition of Hydrohalide [H-X]

$$CH_2=CH_2 + H^+Cl^- \longrightarrow CH_3-CH_2-Cl$$

$$CH_3-CH=CH_2 + H^+Cl^- \longrightarrow CH_3-\underset{Cl}{CH}-CH_3$$

2-chloropropane.

(ii) Addition of halogens →

Detection of Double Bond: Addition of bromine in CCl_4 to an alkene resulting in discharge of reddish brown colour of bromine hence helpful in the "detection of double bond."

$$H_2C=CH_2 + Br_2 \xrightarrow{CCl_4} BrCH_2-CH_2Br$$

vic-Dibromide.
(colourless compound)

2) **From Alcohols:**

- $R-OH + HCl \xrightarrow{ZnCl_2} R-Cl + H_2O$

eg: $CH_3-OH + HCl \xrightarrow{ZnCl_2} CH_3-Cl + H_2O$

⇒ Mixture of $HCl + ZnCl_2$ is k/a "Lucas Reagent"

⇒ Reactivity order: $3^\circ > 2^\circ > 1^\circ$

- $R-OH + PCl_5 \longrightarrow R-Cl + HCl + POCl_3$

eg: $CH_3-OH + PCl_5 \longrightarrow CH_3-Cl + HCl + POCl_3$

- $3R-OH + PX_3 \longrightarrow 3R-X + H_3PO_3$

eg: $3CH_3-OH + PCl_3 \longrightarrow 3CH_3-Cl + H_3PO_3$

- $3R-OH + PBr_3 \xrightarrow[\text{Red Phosphorus.}]{Br_2+} 3(R-Br) + H_3PO_3$

← Halogen compounds are formed during the rxn [Fresh]

• $R-OH + SOCl_2 \longrightarrow R-Cl + HCl_{(g)}\uparrow + SO_2(g)\uparrow$

⇒ Also k/a "Darzen Process" or "Thionyl chloride method".

Q Why Darzen Process is best process to make Haloalkanes from Alcohol?

As Because the side products are gaseous in nature & easily escapable.

eg: $CH_3-OH + SOCl_2 \longrightarrow CH_3Cl + HCl + SO_2$

3) Halogen Exchange Method

a) Finkelstein Reaction: Alky Iodides are often prepared by the rxn of alkyl chlorides / Bromides with NaI in dry acetone.

• $R-X + NaI \xrightarrow[\text{acetone}]{\text{dry}} R-I + NaX$

eg: $CH_3-Cl + NaI \xrightarrow[\text{acetone}]{\text{dry}} CH_3-I + NaCl$

b) Swarts Reaction: The synthesis of alkyl fluorides is best accomplished by heating an alkyl chloride / Bromide in the presence of metallic fluoride.

• $R-X + AgF \longrightarrow R-F + AgX$

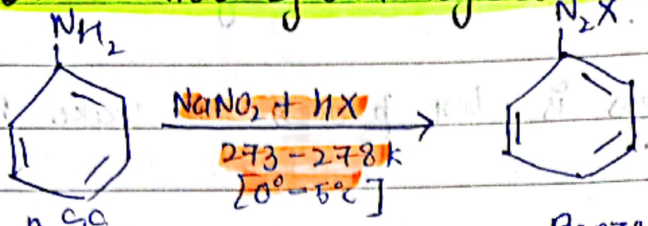
eg: $CH_3-Br + AgF \longrightarrow CH_3-F + AgBr$.

⇒ Metallic fluoride such as AgF, Hg_2F_2, CoF_2 or SbF_3

Methods of preparations of Haloarenes-

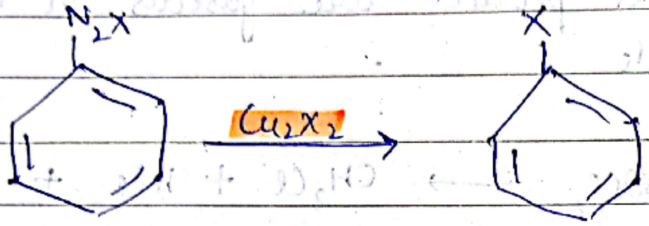
1) From amines by sandmeyer's reaction.

Step I



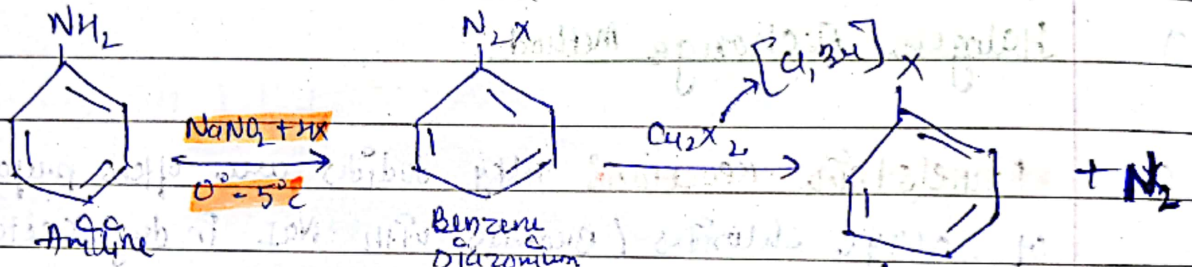
Aniline — Benzene Diazonium salt

Step II



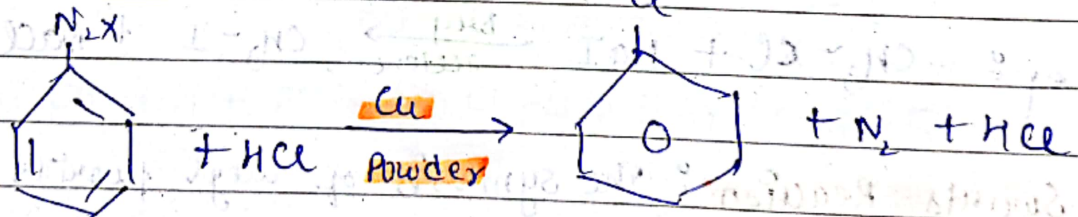
Halo Benzene

Overall

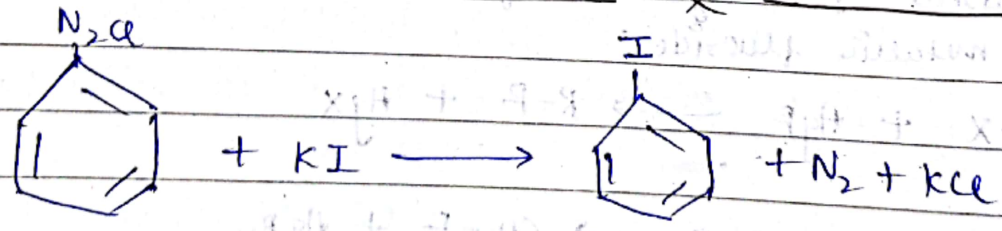


Aniline — Benzene Diazonium salt — Halo Benzene

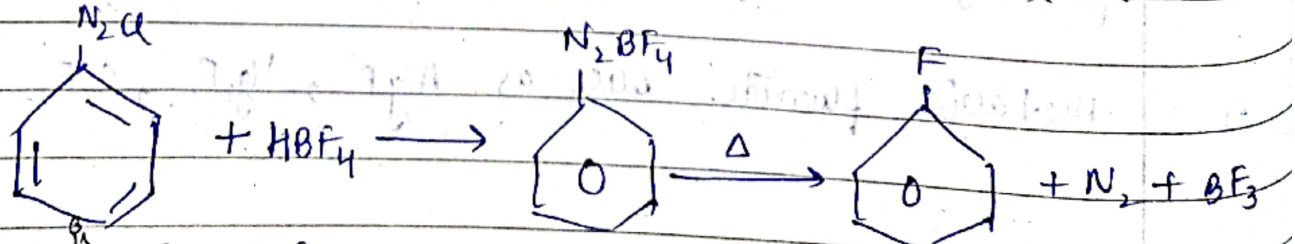
2) Gattermann Rxn.



3)

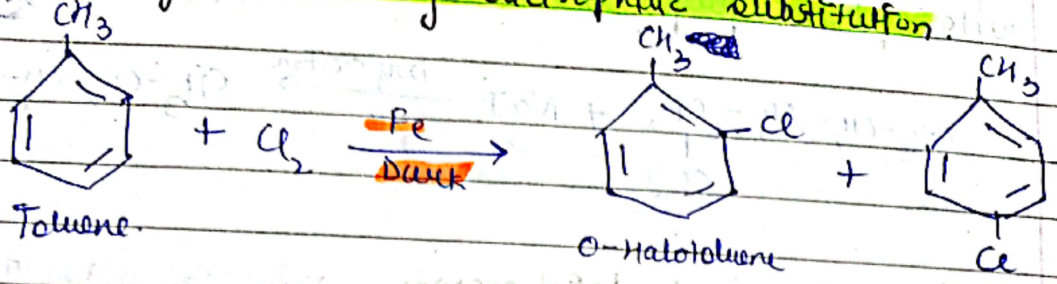


4)

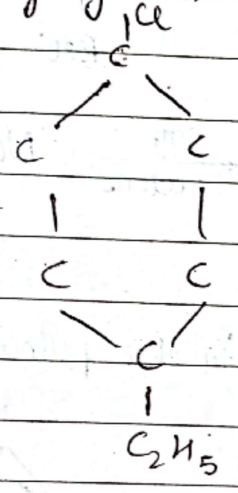


This is Balz-Schiemann Rxn.

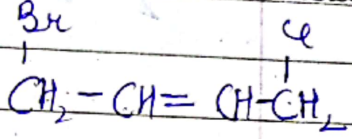
2) From hydrocarbon by electrophilic substitution.



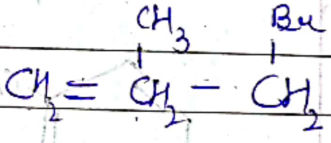
Q 1-chloro-4-ethylcyclohexane.

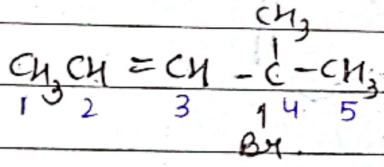


Q 1-bromo-4-chlorobut-2-ene

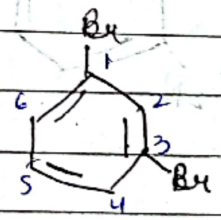


Q 3-Bromo-2-methyl prop-1-ene

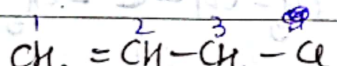


Q 

4-Bromo-4-Methylpent-2-ene.

Q 

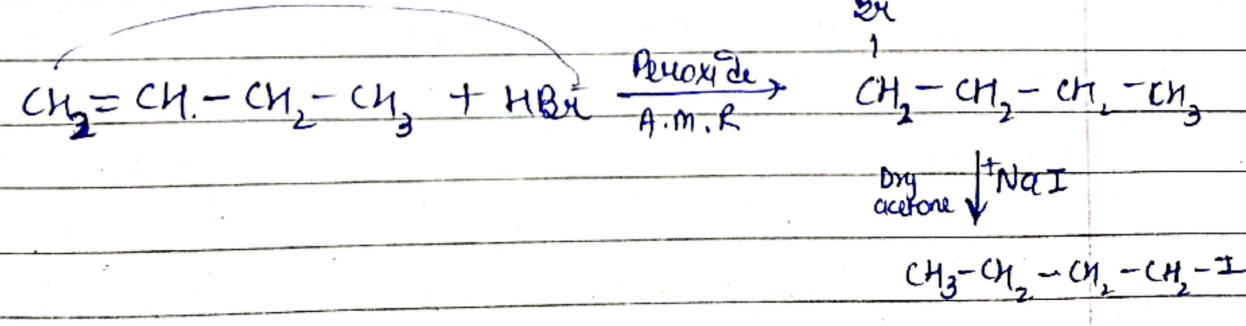
1,3-dibromobenzene.

Q 

3-chloroprop-1-ene

Q How can you convert the following?

But-1-ene to 1-iodobutane.



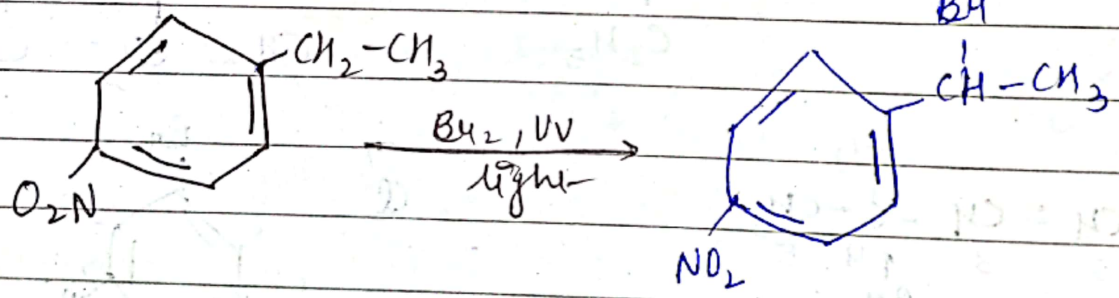
Q write eqn for preparation of 1-Iodobutane from 1-chlorobutane

$$CH_3-CH_2-CH_2-\underset{Cl}{CH_2} + NaI \xrightarrow{\text{Dry acetone}} CH_3-CH_2-CH_2-\underset{I}{CH_2}$$

Q Convert: Propene to 1-Iodopropane → कहीं भी Terminal position पे group लगाना हो तो Anti Markovnikov rule follow होता

$$CH_2=CH-CH_3 + HBr \xrightarrow{\text{Peroxide}} \underset{Br}{CH_2}-CH_2-CH_3 + \underset{+}{NaI} \xrightarrow{\text{Dry acetone}} \underset{I}{CH_2}-CH_2-CH_3$$

Q write the major product in the following.



Q $CH_3-CH=\underset{CH_3}{C}-CH_3 + HBr \xrightarrow{\text{Markov}} CH_3-CH-\underset{CH_3}{\overset{Br}{C}}-CH_3$

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* Physical properties of Haloalkanes

- Colour: Alkyl halides are colourless when pure. However, bromides and iodides develop colour when exposed to light
- Smell: many volatile halides have sweet smell
- Nature: Lower haloalkanes are gaseous in nature while higher haloalkanes and Haloarenes are liquid and solid in nature.
- Boiling point: B.P $\propto$ Molecular mass $\propto \frac{1}{\text{Branching}}$

⇒ B.P of alkyl halides increases with the increase in no. of carbon atoms in alkyl group.

eg: $CH_3Cl < C_2H_5Cl < C_3H_7Cl < C_4H_9Cl$.

⇒ Due to polar nature of C-X bond, Haloalkanes exert dipole-dipole interactions. Hence, Haloalkanes have higher boiling point compared to hydrocarbons with same molecular mass.

eg: $CH_3Cl > CH_4$

⇒ For a given alkyl group the boiling point and densities of different alkyl halides are R-I > R-Br > R-Cl > R-F. This is because with the increase in atomic size, the magnitude of Van der waal forces also increases.

eg: $CH_3Cl < CH_3Br < CH_3-I$

⇒ In alkyl halides the increase in branching decreases the boiling point. This is because increase in branching decreases its surface area which weakens intermolecular forces.

eg: $CH_3-CH_2-CH_2-CH_2-Br > CH_3-\underset{CH_3}{\underset{|}{CH}}-CH_2-Br > CH_3-\underset{CH_3}{\underset{|}{\overset{CH_3}{\overset{|}{C}}}}-Br$

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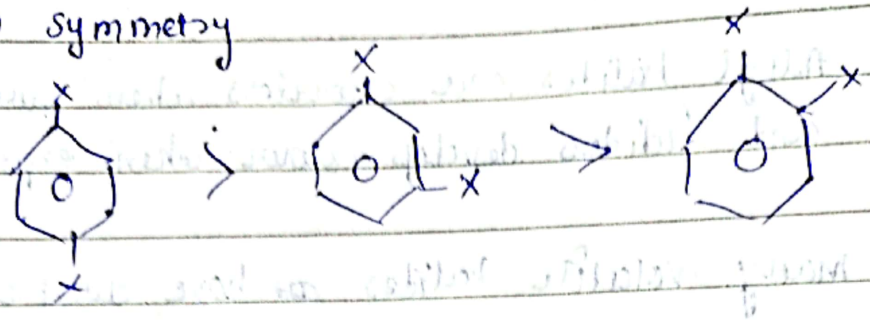
- In case of haloarenes, m.p is directly proportional to symmetry



- Solubility: Alkyl halides are insoluble in water. This is because they can neither form hydrogen bond with water nor can break hydrogen bonding of water molecules.

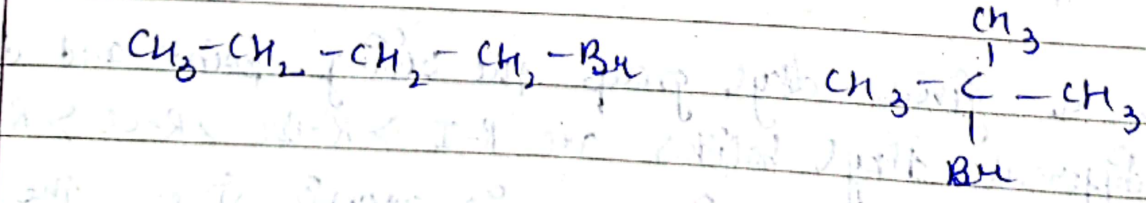
Q why p-dichlorobenzene has higher melting point that that of ortho or meta isomer?

Ans Due to symmetry they have better closed packing.

Q Alkyl halides, though polar, are immiscible with water?

Ans Because the can't make hydrogen bond with water & can't break the hydrogen bond of water molecule.

Q Give Reason: n-Butyl bromide has higher b.p than t-butyl bromide



In Branching B.P decreases because surface area decreases due to which vander waal forces

α carbon = The carbon to which functional group is attached

β carbon = The carbon next to α-carbon on either side

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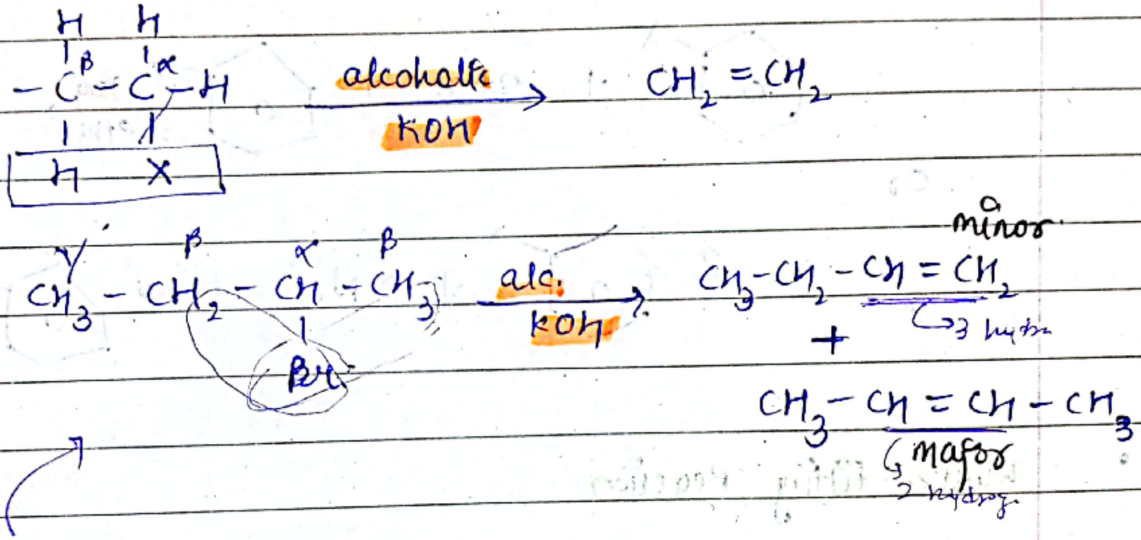
Chemical properties of Haloalkanes

1) Elimination Reaction / Dehydrohalogenation / β-elimination.

- When alkyl halide is treated with alcoholic potassium hydroxide then hydrogen at β-carbon is eliminated along with halogen. A saturated compound is changed into unsaturated compound and alkene are formed.



⇒ In β-elimination of alkyl halide, major product will be the alkene in which double bonded carbon have least no. of hydrogen.

OR

⇒ more alkylated alkene will be the major product.

2) **Reaction with metal.**

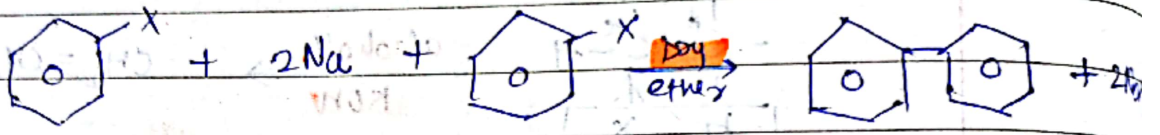
- **Wurtz Reaction.**

$$R-X + 2Na + R-X \xrightarrow{\text{Dry ether}} R-R + 2NaX$$

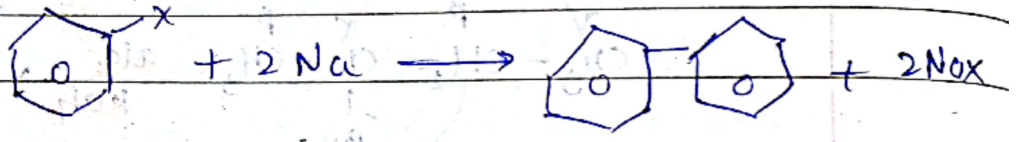
or

$$2R-X + 2Na \xrightarrow{\text{Dry ether}} R-R + 2NaX$$

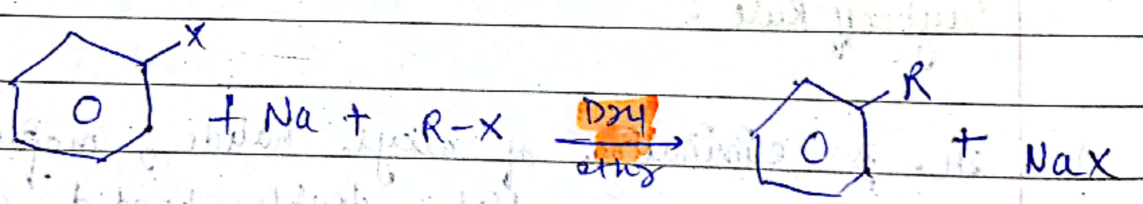
- **Fitting Reaction.**



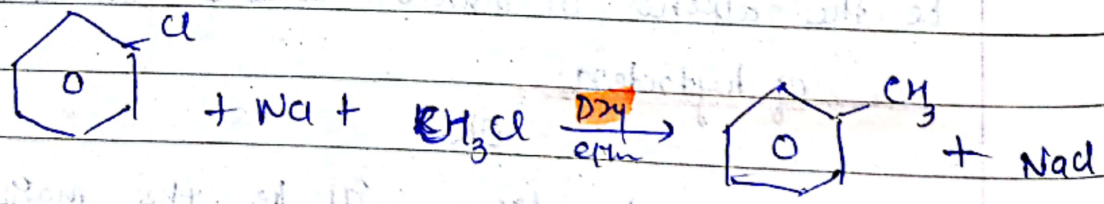
or



- **Wurtz-fitting Reaction.**



eg:



- **Reaction with magnesium metal.**

$$R-X + Mg \xrightarrow{\text{Dry ether}} R-Mg-X$$

Grignard Reagent

or

Organo metallic compound.

$$C_2H_5-Br + Mg \xrightarrow{\text{Dry ether}} CH_3-Mg-Br$$

Date

⇒ Grignard Reagent should be prepared under anhydrous condition because it is proton philic [proton lover] with any source of proton [H+] it form Hydrocarbon.

$$C_2H_5\overset{H}{\underset{|}{-}}Mg-Br + H_2O \longrightarrow C_2H_6 + Mg(OH)Br$$

$$C_3H_7-MgBr + C_2H_5OH \longrightarrow C_3H_8 + Mg(OC_2H_5)Br$$

3) **Nucleophilic substitution Rxn.**

Those substitution rxn in which an atom or group of atom is substituted by a nucleophile [nucleus lover] $\hookrightarrow Nu^{\ominus}$

$$R-X + Nu^{\ominus} \longrightarrow R-Nu + X^{\ominus}$$

a) **Stereochemistry.** [Stereochemical aspects of nucleophilic substitution rxn]

Optical activity:

⇒ **Plane polarised light:** when an ordinary light passed through nicol prism, it travel in single plane called PPL

⇒ **Optically active compound:** Optically active substance are those, which can rote plane polarised light.

Two types of optically active

- **Dextrorotatory** [d-form or +ve]
  - ⇒ Those substance which rotate PPL towards right or clockwise is k/a Dextrorotatory
- **Laevo-rotatory** [l-form or -ve]
  - ⇒ Those substance which rotate PPL towards left or anticlockwise is k/a

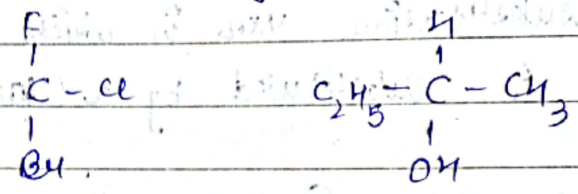
Date

1) **Racemic mixture** : Equimolar mixture of dextro-rotatory and laevorotatory substance so that net rotation of PPL is zero called racemic mixture represented by dl or ± & this process is k/a racemisation

2) **Optical Isomers / Enantiomers** are given by optically active compounds have chiral carbon or asymmetric carbon.

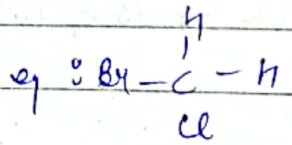
3) **Chiral carbon** : These are the carbon in which all four branch of carbon are with different group

eg :

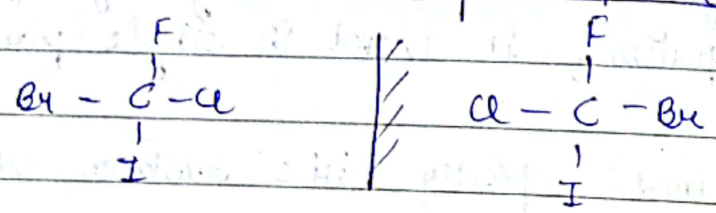


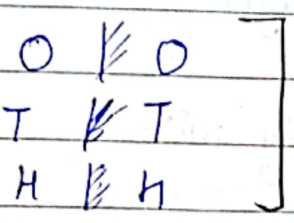
4) **Achiral carbon** : These are the carbon in which all four branch of carbon are not with different group.

eg :

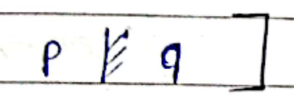


5) **Optical Isomer** : Non-super imposable mirror image.



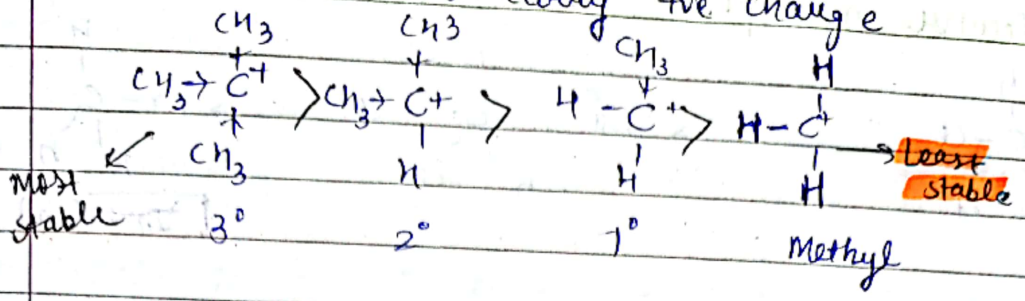


Super imposable



Non-super imposable

• **Carbocation:** Carbon carry +ve charge



⇒ alkyl group are e⊖ donating in nature

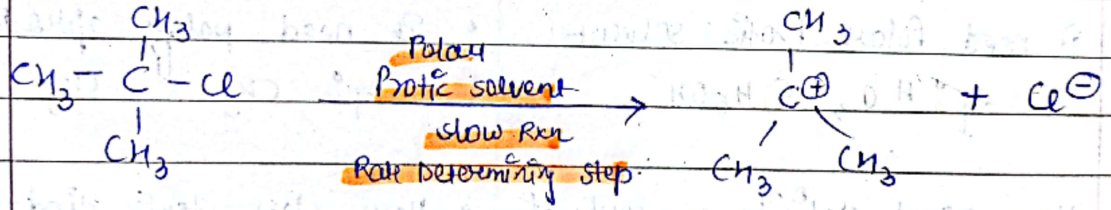
Types of nucleophilic substitution Rxn [2 Types]

(A) ~~Unimolecular~~

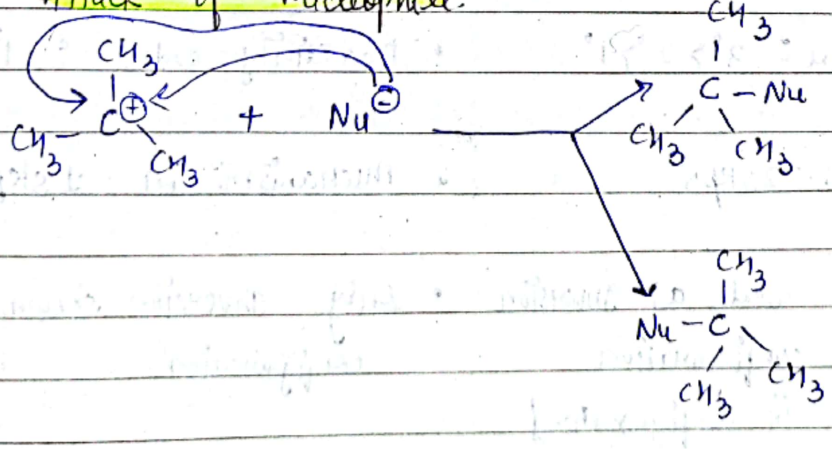
1) Unimolecular Nucleophilic substitution Rxn [S_N1]

⇒ It occurs in two steps:

• **Formation of Carbocation.**



• **Attack of Nucleophile.**



(a) जिस side से leaving grp गया उसी side से दूसरा आया इसे kla → Retention

Racemisation of configuration

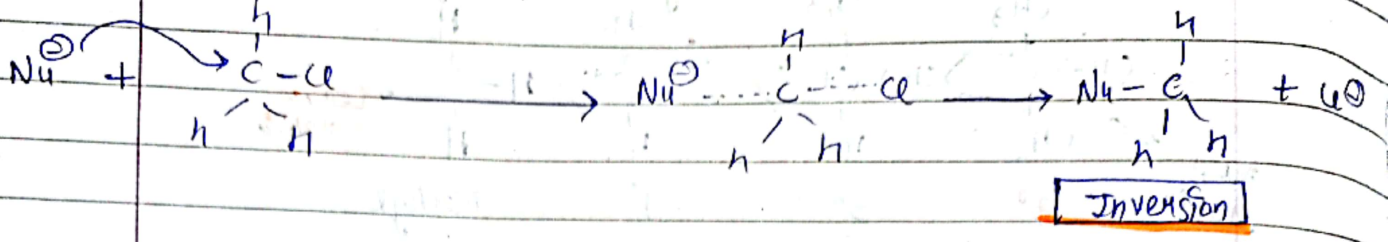
Inversion

(a) जिस side से leaving grp गया उसकी पीछे की side से नया grp आया इसे kla Inversion

⇒ Stability of Carbocation:

Reactivity Order → 3° > 2° > 1°

2) Bimolecular nucleophilic substitution [S_N2]



⇒ less steric Hindrance
↳ स्तनावट

$1^\circ > 2^\circ > 3^\circ$

S_N1 [unimolecular]	S_N2 [Bimolecular]
$R-X + Nu^\ominus \longrightarrow R-Nu + X^\ominus$	
• Rate of Rxn depends on : $k[R-X]$	• Rate = $k[R-X][Nu^\ominus]$
• It need Polar Protic solvent eg : H_2O, C_2H_5OH	• It need polar aprotic solvent eg : $CH_3-\underset{\underset{O}{\|}}{C}-CH_3$
• Here stability of carbocation matters.	• Here less steric Hindrance matters the most
• Reactivity order : $3^\circ > 2^\circ > 1^\circ$	• Reactivity order : $1^\circ > 2^\circ > 1^\circ$
• Mechanism in 2 steps	• Mechanism in 1 step.
• Retention as well as inversion shown in configuration [∴ Racemisation in configuration]	• Only inversion shown in the configuration.

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- $R-F < R-Cl < R-Br < R-I$

Same for both S_N1 & S_N2

- Benzyl and allyl prefer to undergo S_N1 Reaction.
- Order for S_N1 : Benzyl ≥ Allyl ≥ 3° > 2° > 1°

* **some examples of nucleophilic substitution Rxn.**

- $R-X + Nu^- \longrightarrow R-Nu + X^-$

a) $R-X + NaOH \longrightarrow R-OH + NaX$

b) $R-X + \underset{H^+\ OH^-}{H_2O} \longrightarrow R-OH + X-H$

c) $R-X + \underset{H^+\ NH_2^-}{NH_3} \longrightarrow R-NH_2 + HX$

⇒ **Williamson synthesis :**] This Rxn follow S_N2 mechanism.

- $RONa + R-X \longrightarrow R-O-R + NaX$

eg : $C_2H_5-ONa + C_2H_5-Cl \longrightarrow C_2H_5-O-C_2H_5 + NaCl$.

Note : Alkyl halide should be primary, so that ether will be formed
If Alkyl halide is 3° then elimination Rxn takes place
& alkene is formed.

- Reactivity order of elimination Rxn : 3° > 2° > 1°

d) $R-X + KCN \longrightarrow R-C\equiv N + K-X$

e) $R-X + AgCN \longrightarrow R-NC + AgX$

- **Ambident Nucleophile** : which have two attacking centre is k/a ambi---

=) $R-X + KNO_2 \longrightarrow R-ONO$

=) $R-X + AgNO_2 \longrightarrow R-NO_2$

Q Which alkyl halide from the following pair would you expect to react more rapidly by an S_N2 mechanism?

$CH_3-CH_2-\underset{\underset{CH_3}{|}}{CH}-Br$ (2°) or $CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-Br$ (3°)

Reactivity order of S_N2 : $1^\circ > 2^\circ > 3^\circ$

Q Out of chlorobenzene (C_6H_5Cl) and benzyl chloride ($C_6H_5CH_2Cl$), which one gets easily hydrolysed by aqueous NaOH and why?

Benzyl chloride will get easily hydrolysed by aqueous NaOH because the carbon–chlorine bond in benzyl chloride [attached to an aliphatic carbon] is weaker & more reactive than the carbon–chlorine bond in chlorobenzene [attached to an aromatic carbon.]

Q Out of $CH_3-\underset{\underset{CH_3}{|}}{\overset{1^\circ}{CH}}-CH_2-Cl$ and $CH_3-CH_2-\underset{\underset{CH_3}{|}}{\overset{2^\circ}{CH}}-Cl$ which is more reactive towards S_N1 rxn & why?

Ans Reactivity order of S_N1 : $3^\circ > 2^\circ > 1^\circ$

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Q. Write the structure of an isomer of compound C_4H_9Br which is most reactive towards S_N1 Rxn & S_N2 Rxn ?

Ans C_4H_9-Br Isomer.

$CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-Br$, will give S_N1 more rapidly.

$CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-Br$, will give S_N2 more rapidly.

Q. which would undergo S_N2 Rxn faster in the following pair & why?

CH_3-CH_2-Br (1°) and $CH_3-\underset{\underset{Br}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_3$ (3°)

Q-2 " " " S_N1 " " " " " " ?

CH_3-CH_2-Br and $CH_3-\underset{\underset{Br}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_3$

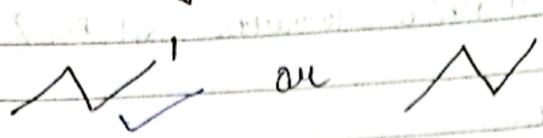
Q. which would undergo S_N2 Rxn faster in the Following

CH_3-CH_2-Br & CH_3-CH_2-I

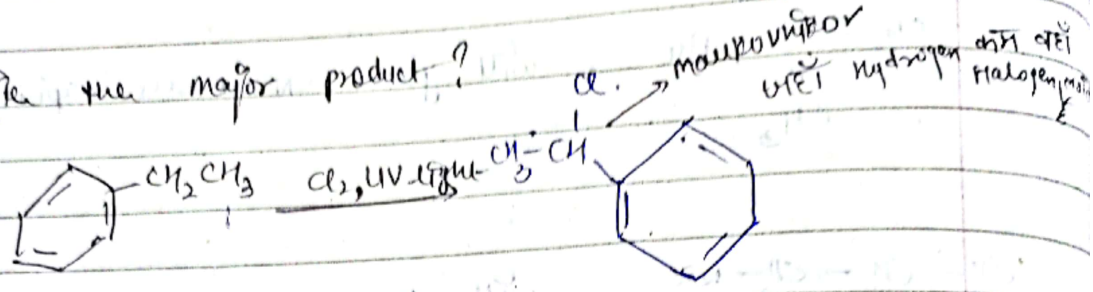
→ Because, $R-F < R-Cl < R-Br < R-I$

$I^{\ominus}$ is a better leaving group.

Q Which will give faster S_N2 ?



Q Write the major product ?



Q Arrange the following compounds in the increasing order of their boiling points :

Bromoform, Dibromomethane, Chloromethane, Bromomethane

$CHBr_3$ CH_2Br_2 CH_3Cl CH_3Br

Ans B.P ∝ Molecular weight

$CH_3Cl < CH_3Br < CH_2Br_2 < CHBr_3$

Q Arrange the following in increasing order of their B.P

1-chloropropane, 2-Chloropropane, 1-Chlorobutane

$CH_2-CH_2-CH_3$ (Cl) $CH_3-CH-CH_3$ (Cl) $CH_2-CH_2-CH_2-CH_3$ (Cl)

Ans 2-Chloropropane < 1-Chloropropane < 1-Chlorobutane

Q What is an Ambident nucleophile ? Give eg :

Ans Those nucleophile which have two attacking centre.

eg : $R-X + KCN \longrightarrow R-C\equiv N + K-X$

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Q $CH_3-CH(OH)-CH_3 \xrightarrow{PCl_5}$ 'A' $\xrightarrow{AgCN}$ 'B'

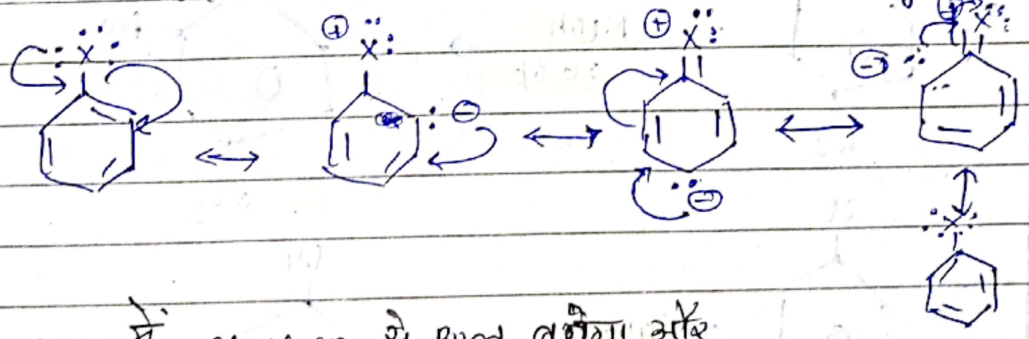
Ans 'A': $CH_3-CH(Cl)-CH_3 \xrightarrow{AgCN} CH_3-CH(NC)-CH_3$

Q $CH_3\overset{\beta}{C}H_2\overset{\alpha}{C}H_2Cl + KOH \xrightarrow{\text{ethanol}}$ 'A' $\xrightarrow{HBr}$ 'B'

$CH_3-CH_2-CH_2Cl \xrightarrow[\text{ether}]{KOH} CH_3-CH=CH_2 + HBr \longrightarrow CH_3-CH_2-CH_2-Br$

* Chemical Properties of Haloarenes.

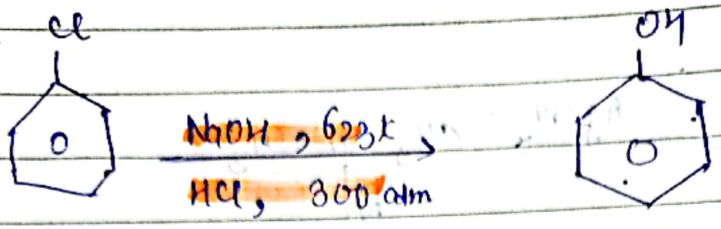
→ Haloarenes are less reactive towards nucleophilic substitution Reaction due to resonance C–X bond have partial double bond character which is not easy to break.



Resonance में, electron से Bond बनेगा और Bond से electron.

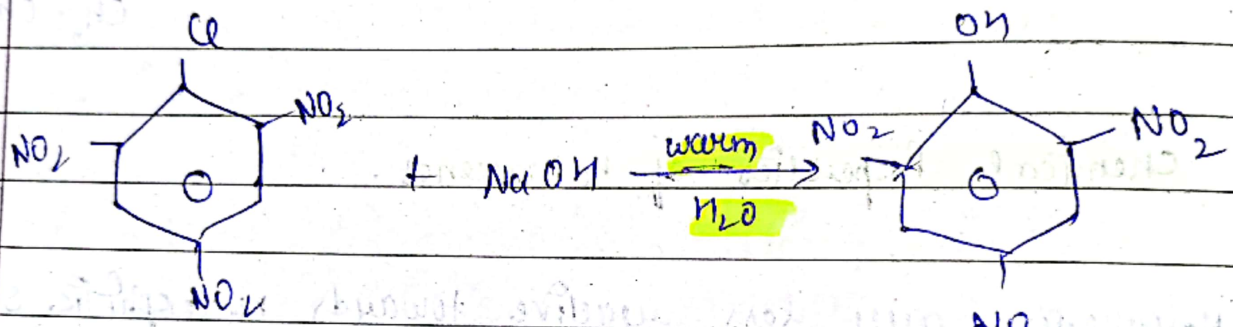
→ Haloarene dipole moment is shorter than Alkyl Halides.

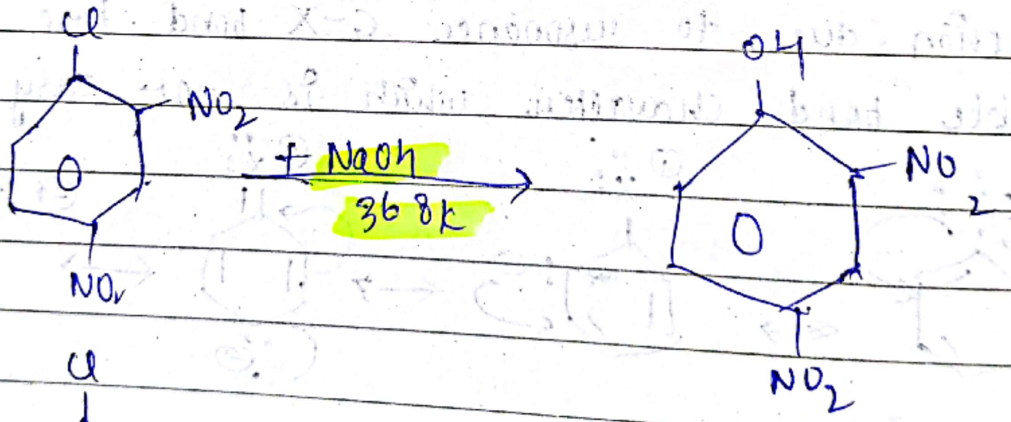
① Nucleophilic Substitution

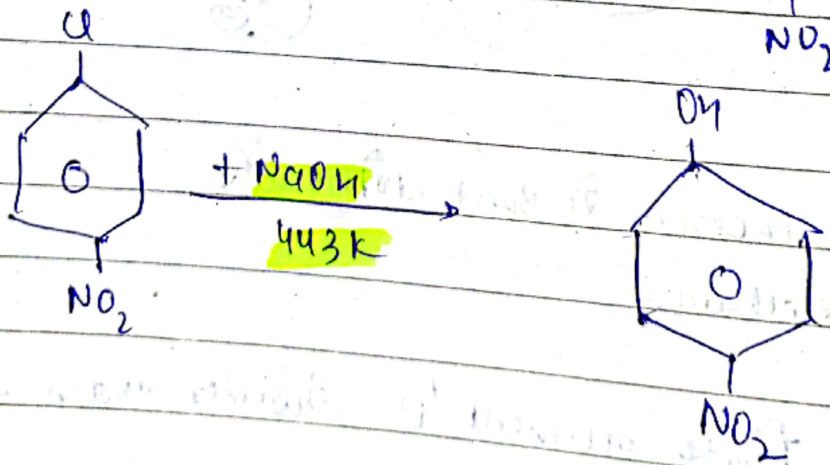


⇒ Ye is ka Dow's process

⇒ Presence of electron withdrawing group like NO_2 increase the reactivity of Haloarenes towards nucleophilic substitution rxn..







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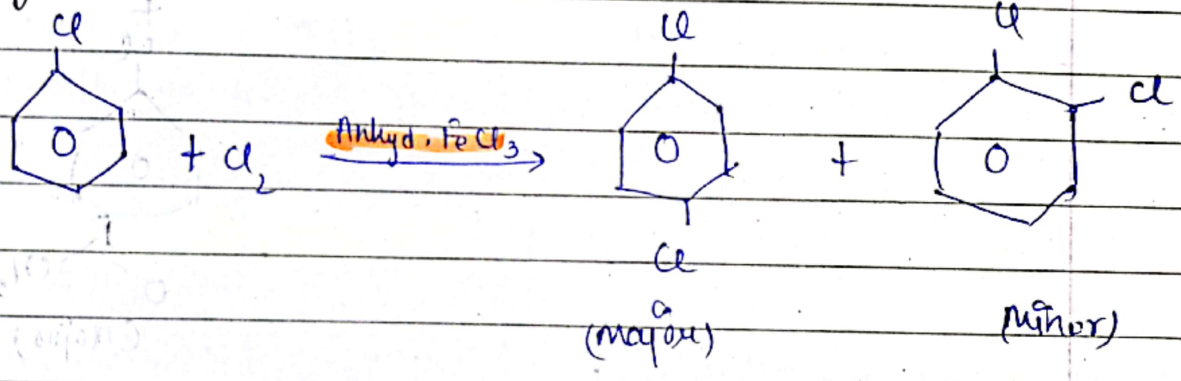
(2) Electrophilic substitution rxn :

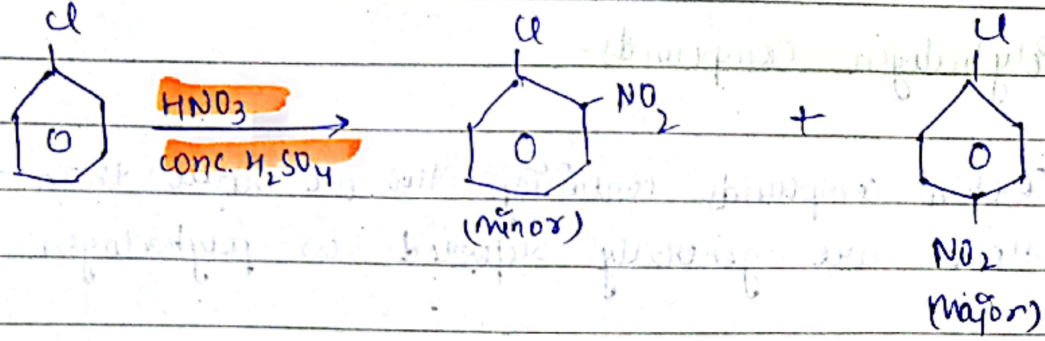
-) Haloarenes undergo electrophilic substitution rxn due to benzene ring Halo group is ortho & para directing. So, the substitution takes place at ortho and para positions.

-) Although halogroup is 'O' 'p' directing but it also has deactivating effect due to -I effect

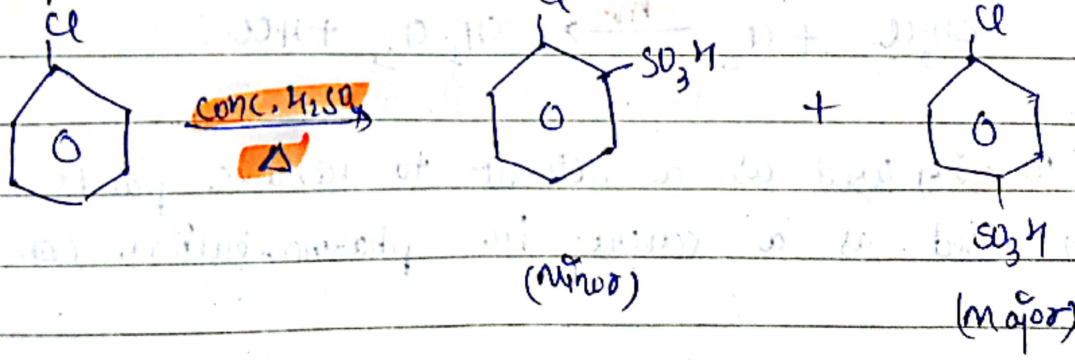
i) Halogenation :



(ii) Nitration :

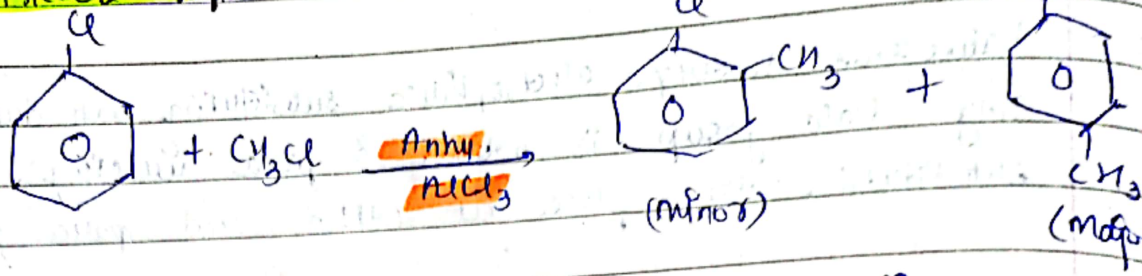


(iii) Sulphonation



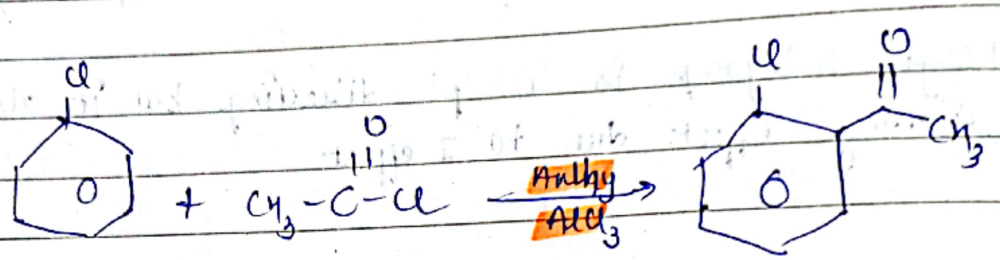
(iv) Friedel Crafts rxn.

Alkylation

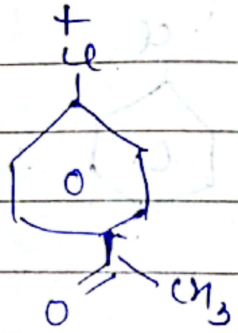


(minor) (Major)

Acylation.



(minor)



(major)

* Polyhalogen Compounds.

a) Carbon compounds containing two or more than two halogen atoms are generally referred as polyhalogen.

1) Dichloromethane [methylene chloride]

$$CH_3Cl + Cl_2 \xrightarrow{h\nu} CH_2Cl_2 + HCl$$

Uses :- a) Used as a solvent to remove paints.

b) Used as a solvent in pharmaceutical companies.

2) Trichloromethane [Chloroform].

$$CH_2Cl_2 + Cl_2 \xrightarrow{h\nu} CHCl_3 + HCl.$$

Uses: ⇒ used in production of the Freon. [CFC] → chlorofluorocarbon
⇒ Used as anesthetic in cough syrup.
⇒ Used as preservative for anatomical specimens.
⇒ Chloroform should be kept in air tight dark bottles. because, it undergoes atmospheric oxidation in the presence of sunlight & form a poisonous gas called "phosgene"

$$\underset{\text{Chloroform.}}{CHCl_3} + O_2 \xrightarrow{h\nu} \underset{\text{Phosgene}}{COCl_2} + HCl$$

3) Triiodomethane [Iodoform].

⇒ It was earlier used as an antiseptic but the antiseptic properties are due to liberation of free iodine & not due to iodoform itself.

Uses: ⇒ It is used to manufacture pharmaceutical products.
⇒ Used as antiseptic, when it comes in contact with skin it liberates free iodine which act as an antiseptic.

4) Tetrachloromethane [Carbon tetrachloride]

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

Uses: ⇒ Used as an fire extinguisher
⇒ used in manufacture of chloroform
⇒ Used in dry cleaning.

- **Freons** - 1, 2

$$CCl_4 + 2HF \longrightarrow CCl_2F_2 + 2HCl.$$

Uses: Used as refrigerants in refrigerator & air conditioner.

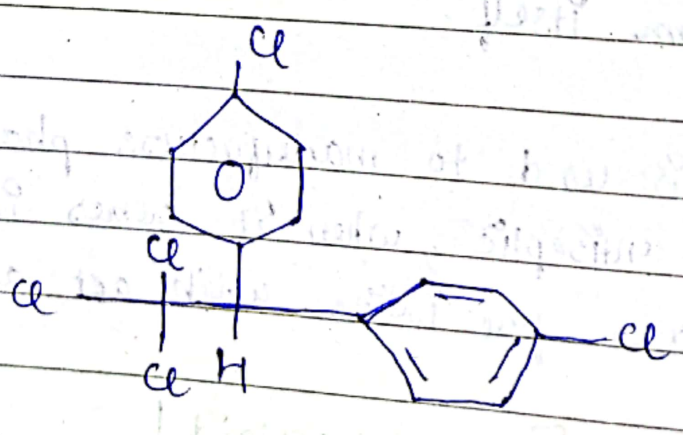
Harm: These freons are responsible for the depletion of Ozone layers.

- **p, p' - Dichloro Diphenyl Trichloroethane [DDT]**

⇒ DDT is a colourless, tasteless & almost odourless crystalline chemical compound.

⇒ It is very effective against the mosquitos that spread malaria and lice that carry typhus.

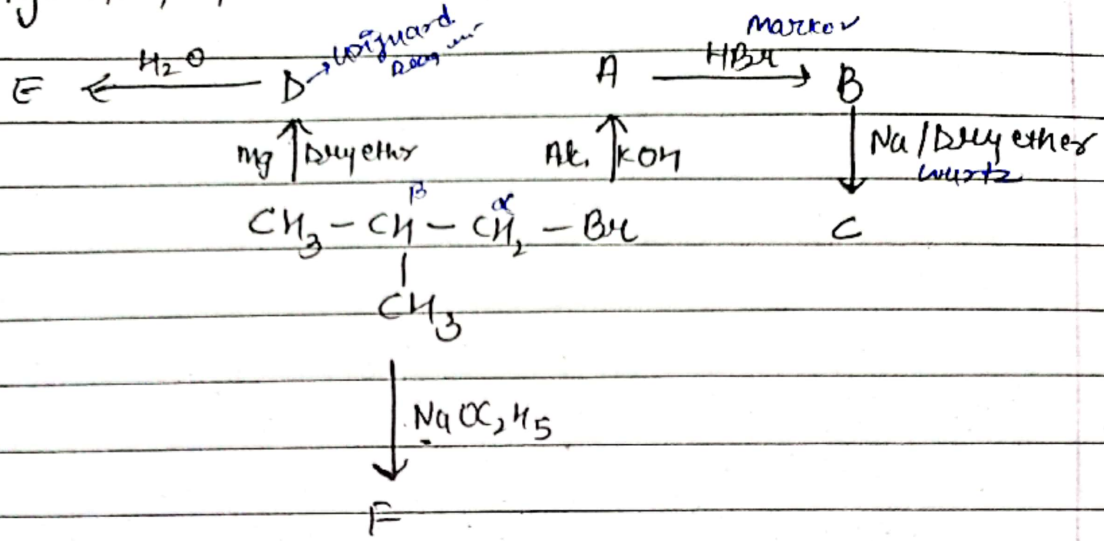
Harm: It is very toxic for fishes. It is not metabolised by animals. Instead it is stored in fatty tissues.



DDT.

Date

Q. Identify A, B, C, D, E and F :



Ans

D = $CH_3-CH(CH_3)-CH_2-BrMg$.

E = $CH_3-CH(CH_3)-CH_3$

A = $CH_3-C(CH_3)=CH_2$

B = $CH_3-C(Br)(CH_3)-CH_3$

C = $(CH_3)_3C-C(CH_3)_3$

F = $CH_3-CH(CH_3)-CH_2(OC_2H_5)$