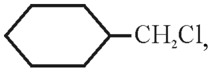
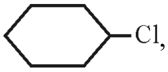
This particular chapter is divided in the following parts with the exam pont of view.

1. Reasoning 2. IUPAC Naming 3.Mechanisms 4.Name Reactions 5.Conversions

REASONINGS

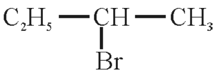
Q1. In the following pairs of halogen compound which is faster under going SN^2 Rx.

(*a*) 

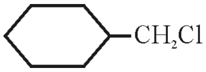
& 

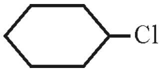
(*b*) 

& 

(*c*) C_4H_9Br & 
$C_2H_5-\underset{Br}{CH}-CH_3$

(*d*) $(CH_3)_3CCl$ & CH_3Cl

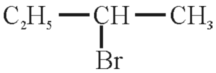
Ans. (*a*) 

(1º Alkyl Halide) > 

(2º Alkyl Halide)

(*b*) 

(bigger size, better leaving group) > 

(*c*) C_4H_9Br (1º) > 
$C_2H_5-\underset{Br}{CH}-CH_3$

(*d*) $(CH_3)_3CCl < CH_3Cl$ (1º Alkyl Halide)

Q2. Predict the order of reactivity of the following compounds in SN^1 and SN^2 Rx.

(*a*) The four isomeric bromo-butanes (*b*) $C_6H_5CH_2Br$, $C_6H_5CH(C_6H_5)Br$, $C_6H_5CH(CH_3)Br$, $C_6H_5C(CH_3)(C_6H_5)$

Ans. (*a*) For SN^1 Rx. (Reactivity depends on stability of carbo cation → 3º > 2º > 1º)

$CH_3CH_2CH_2CH_2Br < (CH_3)_2\ CHCH_2Br < CH_3CH_2CH(Br)CH_3 < (CH_3)_3C.Br$

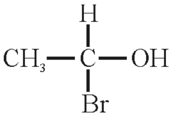
For SN^2 Rx (less steric hindrance more reactive)

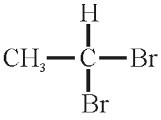
$CH_3CH_2CH_2CH_2Br > (CH_3)_2CHCH_2Br > CH_3CH_2CH(Br)CH_3 > (CH_3)_3C.Br$

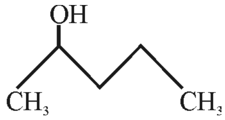
(*b*) For SN^1 Rx → $C_6H_5C(CH_3)(C_6H_5)Br > C_6H_5CH(C_6H_5)Br > C_6H_5CH(CH_3)Br > C_6H_5CH_2Br$

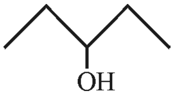
For SN^2 Rx $C_6H_5CH_2Br > C_6H_5CH(CH_3)Br > C_6H_5CH(C_6H_5)Br > C_6H_5C(CH_3)(C_6H_5)Br$.

Q3. Identify chiral and achiral molecules in each of the following pair :-

(*a*) 

(*b*) 

(*c*) 

(*d*) 

Ans. (a) & (c) With four different alkyl group.

Q4. Although chlorine is an EWG yet it is ortho-para directing in electro plilic aromatic substitution Rx.

Ans. Chlorine shows — I effect causing the intermediate carbocation will destabilize but +R effect of Cl stabilizes the intermediate carbocation. The reactivity is controled by the stronger – I effect while orientation is centrolled by weaker reasone effect.

Q5. Haloalkanes react with KCN to form RCN but with AgCN form RNC?

Ans. CN is an ambidient group (can be attached from both the ends). In KCN, it is ionic bond, the reaction occuss through C since C – C bonds are more stronger while in AgCN (covelent bonding), only N electron pair is availale for bond formation.

Q6. RCl is hydrolysed to ROH slowly but the reaction is rapid if a catalytic amount of KI is added to the reaction mixture.

Ans. I^- is stronger nucleoplile so it replace Cl to form RI then RI is more hydrolysed to yield ROH due to I^- ion is a better leaving group than Cl^-.

Q7. Haloalkanes give nucleophilic substitution while Haloarenes give Electrophilic substitution reactions.

Ans. Haloalkanes are more polar than Haloarenes. so their C has more +ve character so they give nucleophilic substitution while haloarenes has a benzene ring which shows resonance. haloarenes give electrophilic reaction due to –I effect and +R effect.

Q8. Why is sulphuric acid not used during the reaction of Alcohols with KI.

Ans. Sulphuric acid oxidises KI to I_2.

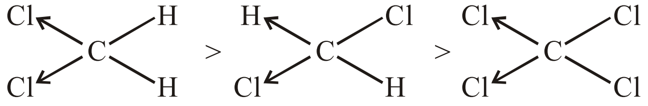
Q9. Arrange on the basis of increasing Boiling Point. (*a*)bromomethan , bromoform, Chloromethane, dichloromethane (*b*)1–chloropropane, isopropyl chloride, 1–chlorobutane.

Ans. (*a*) Bromoform > dibromomethane > bromomethane > Chloromethane (BP α moleculer wt.)

(*b*) Isopropyl chloride (side chain) < 1 chloropropane < 1 Chlorobutane (more branching, more surface area less B.P.)

Q10. Which of the following has highest dipole moment CH_3Cl, CH_2Cl_2, CCl_4

$CH_2Cl_2 > CHCl_3 > CCl_4 \Rightarrow$



Q11. The dipole moment of chloro benzene lower than cyclohexylchloride.

Ans. Cyclohexylchloride has cyclohexyl as a EDG group. It increase electron density at Cl atom makes it polar while in case chlorobenzene which has benzene ring as EWG and resonating ring it dipole meoment is lower.

Q12. Alkyl halide though polar not soluble in water.

Ans. Alkyl halide cannot form H-bond with water molecules.

Q13. RMgX should be prepared under anhydrons conditions

Ans. RMgX is very reactive, they react with moisture present in apparatus or the starting material.

Q14. Out of $C_6H_5CH_2Cl$ and $C_6H_5CHCl\ C_6H_5$ which is Easily hydrolysed by KOH (aq.)

Ans. $C_6H_5CHClC_6H_5$ is 2º alkyl halide which is more reactive under SN^1 reaction but under SN^2 reaction 1º alkyl halide ($C_6H_5CH_2Cl$) is more hydrolysed.

Q15. p-dichlorobenzene has high M.P and low solubility than O-dichlorobenzene.

Ans. p-dichlorobenzene has symmetrical structrre so its MP is high and solubitlity low.

Q16. Why $SOCl_2$ is used for preparation of Alkyl Halide from ROH.

Ans. On reaction between $SOCl_2$ and ROH. we get RCl, **HCl(g) and SO_2(g) as escapible gases.**

Q17. Arrange the following in order of increasing ease towards nucleophile.Rx.

4-Nitrochlorobenzene, chlorobenzene, 2, 4, 6-trinitrochlorobenzene, 2, 4-dinitrochlorobenzene

Ans. 2, 4, 6 trinitrochlorobenzene > 2, 4-dinitrochlorobenzene > 4-nitrochlorobenzene > Chlorobenzene. Among the aromatic compounds have moleculer formula C_7H_7Cl how many isomess are possible. Write strictures and name. Identity all the possible monochloro structural isomess that would be expected to form on free radical chloronation of $(CH_3)_2CH\ CH_2CH_3$. Differentiate between (*a*) chiral and achiral, (*b*) retentin and inversion.

Q18. What is enantionmers and racimic mixture.

Q19. Allyl chloride is hydrolysed more radily than n-propyl chloride. Vinyl choloride is hydrolysed more slowly than ethyl chloride

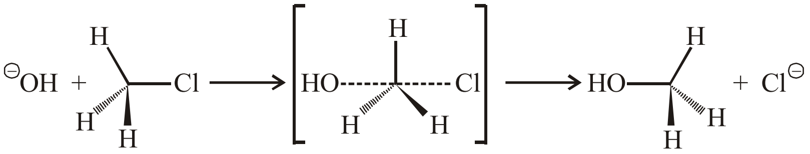
Q20. Explain. reaction between Alkyl halide and KOH(aq) yield Alcohol but with KOH(aq) yield alkenes.

Q21. Which one is better nucleophile Br^- and I^-.

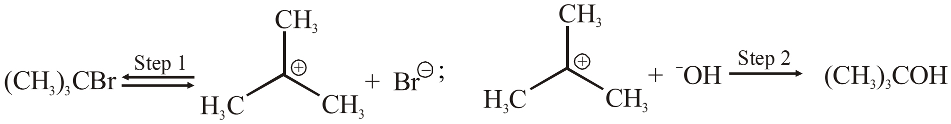
Q22. Among the isomeric alkanes of moleculer formula C_5H_{12} Identify the one than on photochemical chlorohation yields (*i*) A single monochloride, (*ii*) three isomeric monochlorides, (*iii*) Four isomeric monochloride. Uses of freon 12, DDT, Carbontetrachloride and Iodeform.

MECHANISMS

S_N2 Mechanism:

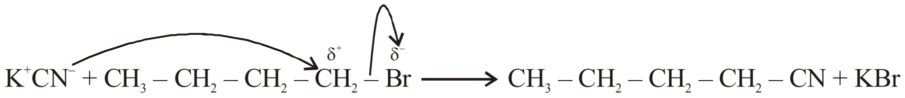


S_N1 Mechanism:



Sr. No.	Factors	S_N2 Reactions	S_N1 Reactions
1	Number or Steps	One: $R:L + \overset{\theta}{Nu} \rightarrow R:\overset{\theta}{Nu} + L$	Two: 1. $R:L \xrightarrow{Slow} R^+ + :L$ 2. $R^+ + Nu^- \xrightarrow{Fast} R:Nu$
2	Reaction rate and order	**Second order:** Rate ∝ [Substrate] [Nucleophile] or Rate = K_2[RL][:Nu]	**First order:** Rate ∝ [Substrate] or Rate = κ_1[RL]
3	Molecularity	Bimolecular	Unimolecular
4	TS of slow step	$\overset{\delta^-}{:Nu}----C----\overset{\delta^-}{:L}$	$:Nu---\overset{\delta^+}{C}---:\overset{\delta^-}{L}---Nu:$
5	Reacting nucleophile	The carbon of the substrate is attacked by the nucleophile, exclusively from the back side.	The nucleophile can attack the carbon of the substrate from both sides. However, the attack from the back side predominates.
6	Stereochemistry	Complete inversion of configuration takes places	Inversion and retention takes place
7	Reactivity order of alkyl halides	Methyl I > 1° > 2° > 3° halides. (I > Br > Cl > F)	3° > 2° > 1° > methyl halides. (I > Br > Cl > F)
8	Rearrangement	No rearranged product is formed (except for allylic)	Rearranged products can be formed.
9	Nature of nucleophiles	Favoured by strong and high concentration of nucleophiles.	Favoured by mild and low concentration of nucleophiles
10	Polarity	Favoured by solvents of low polarity	Favoured by solvents of high polarity.
11	Reaction rate determining factor	By steric hindrance	By electronic factor (stability of R)
12	Catalysis	Not catalysed by any catalyst (phase transfer)	Catalysed by Lewis and Bronsted acids, e.g., Aq. ACl_3, $ZnCl_2$ and strong HA.

Write the mechanism of the following reaction: $nBuBr + KCN \xrightarrow{EtOH-H_2O} nBuCN$

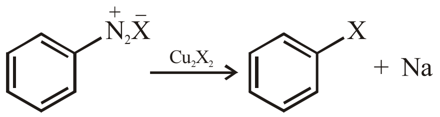


$K^+CN^- + CH_3 - CH_2 - CH_2 - \overset{\delta^+}{CH_2} - \overset{\delta^-}{Br} \longrightarrow CH_3 - CH_2 - CH_2 - CH_2 - CN + KBr$

n-Butyl bromide *n*-Butyl cyanide

NAME REACTIONS

1. Sandmeyer's Reaction:

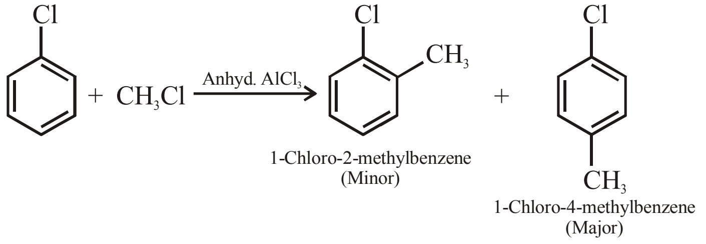


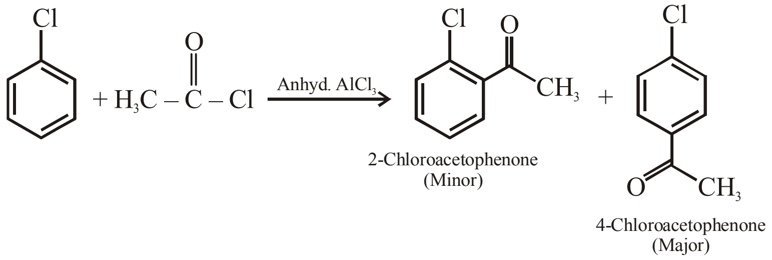
2. Finkelstein Reaction: $RX + NaI \rightarrow RI + NaX$ (solvent - Acetone)

3. Swarts Reaction: $CH_3Br + AgF \rightarrow CH_3F + AgBr$

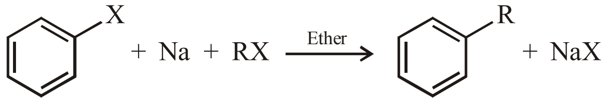
4. Wurtz Reaction: $RX + 2Na + RX \rightarrow R - R + 2NaX$

5. Friedel Crafts Reaction:

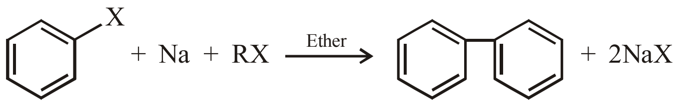




6. Wurtz Fitting Reaction:



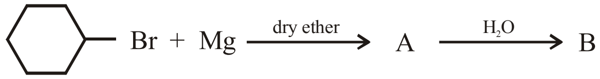
7. Fitting Reaction:



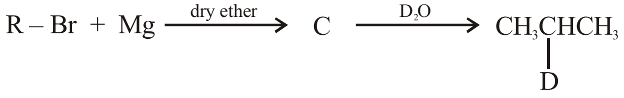
CONVERSIONS

Q1. Identify A, B, C, D, E, R and R^1 in the following:

(i)

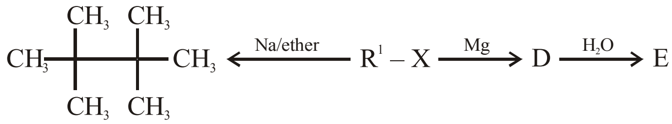


(ii)

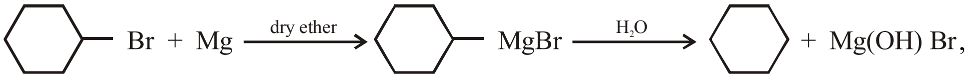


$$R-Br + Mg \xrightarrow{\text{dry ether}} C \xrightarrow{D_2O} CH_3\underset{\underset{D}{|}}{C}HCH_3$$

(iii)



Ans.

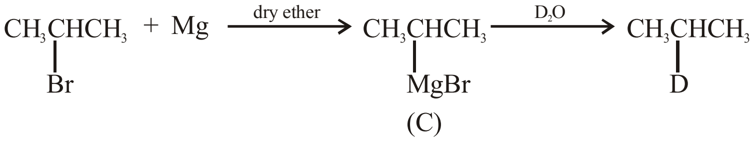


Bromocydohexane

Cyclohexylmagnesium bromide (A)

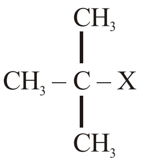
Cyclohexane (B)

since D of D_2O gets attached to the carbon atom to which MgBr is attached, C is $CH_3\underset{\underset{MgBr}{|}}{C}HCH_3$ Isopropylmagnesium bromide. Therefore, the compound R–Br is $CH_3\underset{\underset{Br}{|}}{C}HCH_3$ 2-Bromopropane



$$CH_3\underset{\underset{Br}{|}}{C}HCH_3 + Mg \xrightarrow{\text{dry ether}} \underset{(C)}{CH_3\underset{\underset{MgBr}{|}}{C}HCH_3} \xrightarrow{D_2O} CH_3\underset{\underset{D}{|}}{C}HCH_3$$

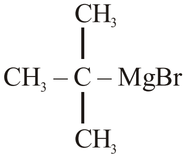
. The halide, R^1"X,



$$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-X$$

tert-Butylhalide

. Therefore, compound D is



$$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-MgBr$$

tert-Butytmagnesiumbromide

Q2. How will you bring about the following conversions?

(i)	Ethanol to but-1-yne	**(ii)**	Ethane to bromoethene
(iii)	Propene to 1-nitropropane	**(iv)**	Toluene to benzyl alcohol
(v)	Propene to propyne	**(vi)**	Ethanol to ethyl fluoride
(vii)	Bromomethane to propanone	**(viii)**	But-1-ene to but-2-ene
(ix)	1-Chlorobutane to n-octane	**(x)**	Benzene to biphenyl.

Ans. **(i)**

$$\underset{\text{Ethanol}}{CH_3CH_2OH} \xrightarrow{SOCl_2,\ \text{Pyridine}} \underset{\text{Chloroethane}}{CH_3CH_2Cl} + SO_2 + HCl$$

$$HC \equiv CH + NaNH_2 \xrightarrow{\text{Liq. } NH_3} HC \equiv \overset{-\ +}{CNa}$$

$$\underset{\text{Chloroethane}}{CH_3CH_2 - Cl} + HC \equiv \overset{-\ +}{CNa} \longrightarrow \underset{\text{But-1-yne}}{CH_3CH_2C \equiv CH} + NaCl$$

(ii)

$$\underset{\text{Ethane}}{CH_3 - CH_3} \xrightarrow[\text{or heat}]{Br_2\ /\ \text{UV light}} \underset{\text{Bromoethane}}{CH_3 - CH_2Br} + HBr \xrightarrow[KOH(alc.),\ \Delta]{-HBr} CH_2 = CH_2 \xrightarrow{Br_2\ /\ CCl_4} \underset{\text{vic-Dibromide}}{BrCH_2 = CH_2Br}$$

$$\xrightarrow[KOH(alc)]{\Delta} \underset{\text{Bromoethane}}{CH_2 = CHBr}$$

(iii)

$$\underset{\text{Propene}}{CH_3 - CH = CH_2} + HBr \xrightarrow{\text{Peroxide}} \underset{\text{1-Bromopropane}}{CH_3 - CH_2 - CH_2Br} \xrightarrow{AgNO_2} AgBr + \underset{\text{1-Nitropropane}}{CH_3 - CH_2 = CH_2NO_2}$$

(iv) Do yourself.

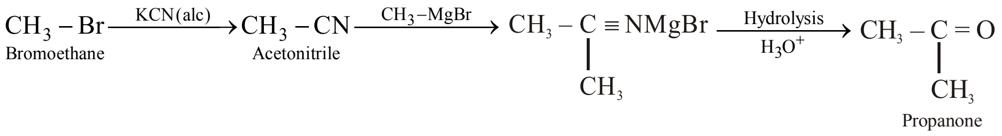
(v)

$$\underset{\text{Propene}}{CH_3 - CH = CH_2} \xrightarrow{Br_2\ /\ CCl_4} \underset{\text{1,2-Dibromopropane}}{CH_3 - CHBr = CH_2Br} \xrightarrow[\text{Liq. } NH_3]{NaNH_2} \underset{\text{Propyne}}{CH_3 - C \equiv CH}$$

(vi)

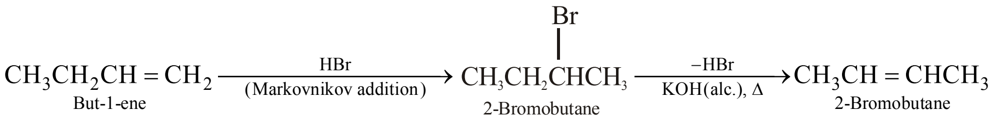
$$\underset{\text{Ethanol}}{CH_3 - CH_2 = OH} \xrightarrow[-POCl_3,\ -HCl]{PCl_5} \underset{\text{Chloroethane}}{CH_3 - CH_2 = Cl} \xrightarrow{AgF} \underset{\text{Ethyl fluoride}}{CH_3 - CH_2 - F}$$

(vii)



$$\underset{\text{Bromoethane}}{CH_3 - Br} \xrightarrow{KCN(alc)} \underset{\text{Acetonitrile}}{CH_3 - CN} \xrightarrow{CH_3-MgBr} CH_3 - \underset{\substack{|\\ CH_3}}{C} \equiv NMgBr \xrightarrow[H_3O^+]{\text{Hydrolysis}} \underset{\text{Propanone}}{CH_3 - \underset{\substack{|\\ CH_3}}{C} = O}$$

(viii)

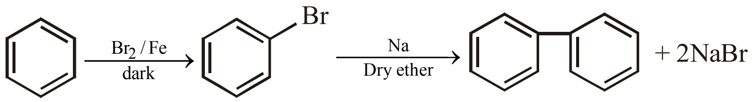


$$\underset{\text{But-1-ene}}{CH_3CH_2CH = CH_2} \xrightarrow[\text{(Markovnikov addition)}]{HBr} \underset{\text{2-Bromobutane}}{CH_3CH_2\overset{\substack{Br\\ |}}{C}HCH_3} \xrightarrow[KOH(alc.),\ \Delta]{-HBr} \underset{\text{2-Bromobutane}}{CH_3CH = CHCH_3}$$

(ix)

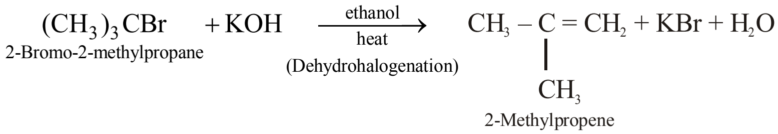
$$\underset{\text{1-Chlordrutane}}{2CH_3CH_2CH_2CH_2 - Cl} + 2Na \xrightarrow[-2NaCl]{\text{dry ether}} \underset{\text{n-Octane}}{CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_3}$$

(x)



Benzene Benzene Diphenyl

1. $$\underset{\text{1-Chloropropane}}{CH_3CH_2CH_2Cl} + NaI \xrightarrow[\substack{\text{heat} \\ \left(\text{Finkelstein reaction}\right)}]{\text{acetone}} \underset{\text{1–Iodopropane}}{CH_3CH_2CH_2I} + NaCl$$

2. 

$$\underset{\text{2-Bromo-2-methylpropane}}{(CH_3)_3CBr} + KOH \xrightarrow[\substack{\text{heat} \\ \text{(Dehydrohalogenation)}}]{\text{ethanol}} \underset{\text{2-Methylpropene}}{CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}}=CH_2} + KBr + H_2O$$

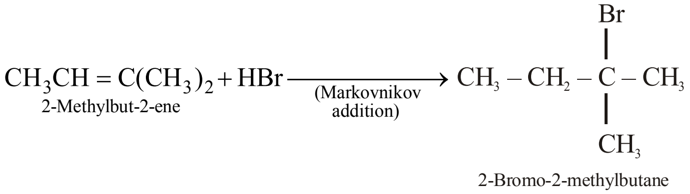
3. $$\underset{\text{2-Bromobutane}}{CH_3CH(Br)CH_2CH_3} + NaOH \xrightarrow{\text{water}} \underset{\text{Butan-2-ol}}{CH_3CH(OH)CH_2CH_3} + NaBr$$

4. $$\underset{\text{Bromobutane}}{CH_3CH_2Br} + KCN \xrightarrow[\substack{\text{(Nucleophilic} \\ \text{substitution)}}]{\text{aq. ethanol}} \underset{\text{Cyanoethane}}{CH_3CH_2CN} + KBr$$

5. $$\underset{\text{Sodium phenoxide}}{C_6H_5ONa} + \underset{\text{Chloroethane}}{C_2H_5Cl} \xrightarrow{\text{(Williamson synthesis)}} \underset{\text{Phenetole}}{C_6H_5-O-C_2H_5} + NaCl$$

6. $$\underset{\text{1-Propanol}}{CH_3CH_2CH_2OH} + SOCl_2 \longrightarrow \underset{\text{1-Chloropropane}}{CH_3CH_2CH_2Cl} + SO_2 + HCl$$

7. $$\underset{\text{But-1-ene}}{CH_3CH_2CH=CH_2} + HBr \xrightarrow[\substack{\text{(Anti-Markovnikov's} \\ \text{addition)}}]{\text{Peroxide}} \underset{\text{1-Bromobutane}}{CH_3CH_2CH_2CH_2-Br}$$

8. 

$$\underset{\text{2-Methylbut-2-ene}}{CH_3CH=C(CH_3)_2} + HBr \xrightarrow[\substack{\text{(Markovnikov} \\ \text{addition)}}]{} \underset{\text{2-Bromo-2-methylbutane}}{CH_3-CH_2-\overset{\displaystyle Br}{\overset{|}{\underset{\displaystyle CH_3}{\underset{|}{C}}}}-CH_3}$$

Q3. How the following conversions can be carried out?

(i) Propene to propan-1-ol

(ii) Ethanol to but-1-yne

(iii) 1-Bromopropane to 2-bromopropane

(iv) Toluene to benzyl alcohol

(v) Benzene to 4-bromonitrobenzene

(vi) Benzyl alcohol to 2-phenylethanoic acid

(vii) Ethanol to propanenitrile

(viii) Aniline to chlorobenzene

(ix) 2-Chlorobutane to 3, 4-dimethylhexane

(x) 2-Methyl-1-propene to 2-chloro-2-methylpropane

(xi) Ethyl chloride to propanoic acid

(xii) But-1-ene to n-butyliodide

(xiii) 2-Chloropropane to 1-propanol

(xiv) Isopropyl alcohol to iodoform

(xv) Chlorobenzene to *p*-nitrophenol

(xvi) 2-Bromopropane to 1-bromopropane

(xvii) Chloroethane to butane

(xviii) Benzene to diphenyl

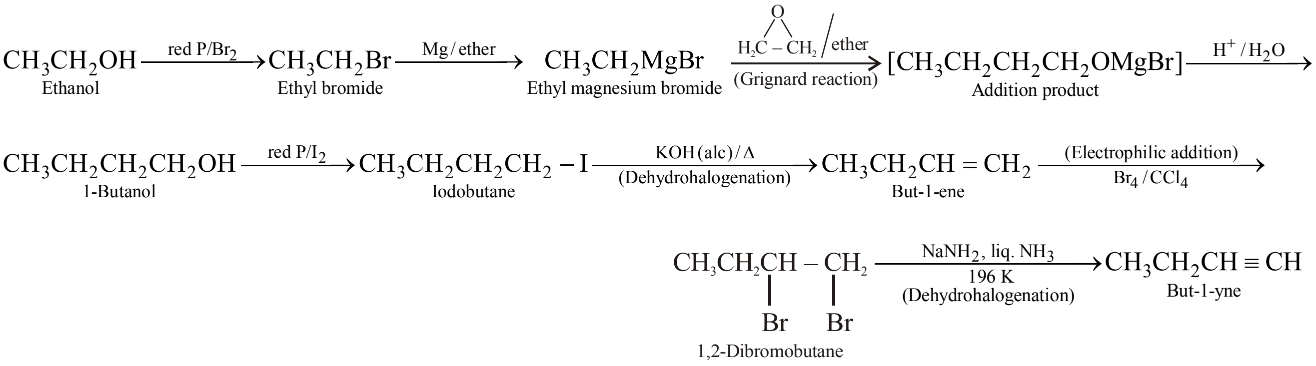
(xix) *tert*-Butyl bromide to isobutyl bromide

(xx) Aniline to phenylisocyanide

(i)

$$\underset{\text{Propene}}{CH_3-CH=CH_2}\xrightarrow[\text{(Anti-Markovnikov addition)}]{\text{HBr/Peroxide}}\underset{\text{1-Bromopropane}}{CH_3-CH_2-CH_2-Br}\xrightarrow[\text{aq. KOH/}\Delta]{\text{(Nucleophilic substitution)}}\underset{\text{Propan-1-ol}}{CH_3-CH_2-CH_2-OH}$$

(ii)

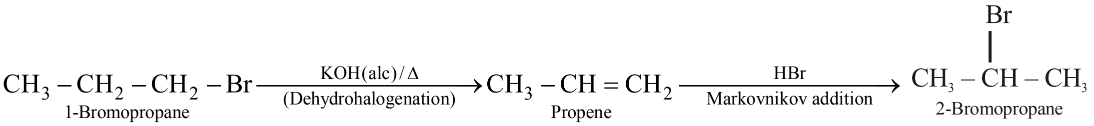


$$\underset{\text{Ethanol}}{CH_3CH_2OH}\xrightarrow{\text{red P/}Br_2}\underset{\text{Ethyl bromide}}{CH_3CH_2Br}\xrightarrow{\text{Mg/ether}}\underset{\text{Ethyl magnesium bromide}}{CH_3CH_2MgBr}\xrightarrow[\text{(Grignard reaction)}]{H_2C-CH_2\text{ (O) / ether}}\underset{\text{Addition product}}{[CH_3CH_2CH_2CH_2OMgBr]}\xrightarrow{H^+/H_2O}$$

$$\underset{\text{1-Butanol}}{CH_3CH_2CH_2CH_2OH}\xrightarrow{\text{red P/}I_2}\underset{\text{Iodobutane}}{CH_3CH_2CH_2CH_2-I}\xrightarrow[\text{(Dehydrohalogenation)}]{\text{KOH(alc)/}\Delta}\underset{\text{But-1-ene}}{CH_3CH_2CH=CH_2}\xrightarrow[Br_4/CCl_4]{\text{(Electrophilic addition)}}$$

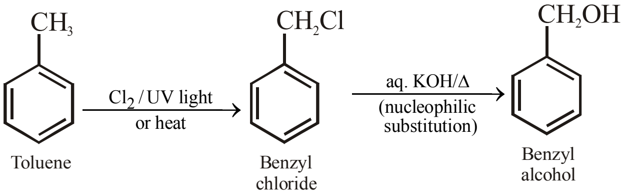
$$\underset{\text{1,2-Dibromobutane}}{CH_3CH_2\underset{Br}{CH}-\underset{Br}{CH_2}}\xrightarrow[\substack{\text{196 K}\\\text{(Dehydrohalogenation)}}]{NaNH_2,\text{ liq. }NH_3}\underset{\text{But-1-yne}}{CH_3CH_2CH\equiv CH}$$

(iii)

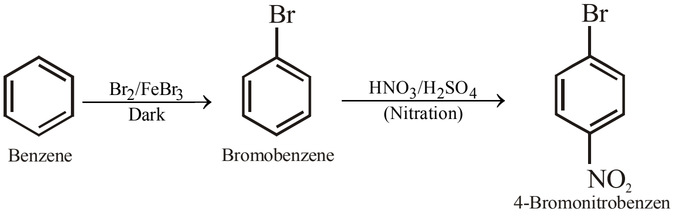


$$\underset{\text{1-Bromopropane}}{CH_3-CH_2-CH_2-Br}\xrightarrow[\text{(Dehydrohalogenation)}]{\text{KOH(alc)/}\Delta}\underset{\text{Propene}}{CH_3-CH=CH_2}\xrightarrow[\text{Markovnikov addition}]{\text{HBr}}\underset{\text{2-Bromopropane}}{CH_3-\overset{Br}{CH}-CH_3}$$

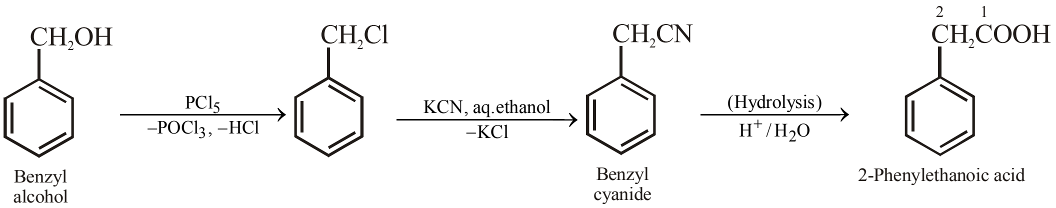
(iv)



(v)



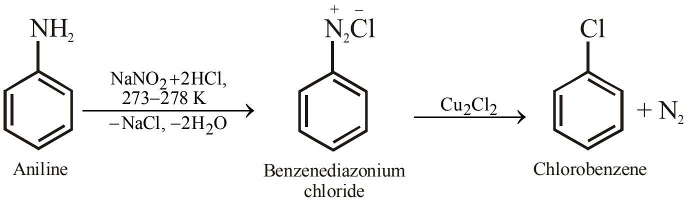
(vi)



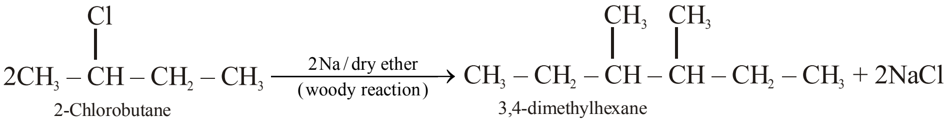
(vii)

$$\underset{\text{Ethanol}}{CH_3-CH_2-OH}\xrightarrow{\text{red P/}Br_2}\underset{\text{Bromoethane}}{CH_3-CH_2-Br}\xrightarrow{\text{KCN, aq. ethanol}}\underset{\text{Propanenitrile}}{CH_3-CH_2-CN}$$

(viii)



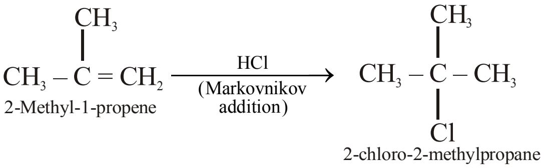
(ix)



$$2CH_3-\overset{\overset{Cl}{|}}{CH}-CH_2-CH_3 \xrightarrow[\text{(woody reaction)}]{2Na/\text{dry ether}} CH_3-CH_2-\overset{\overset{CH_3}{|}}{CH}-\overset{\overset{CH_3}{|}}{CH}-CH_2-CH_3+2NaCl$$

2-Chlorobutane 3,4-dimethylhexane

(x)



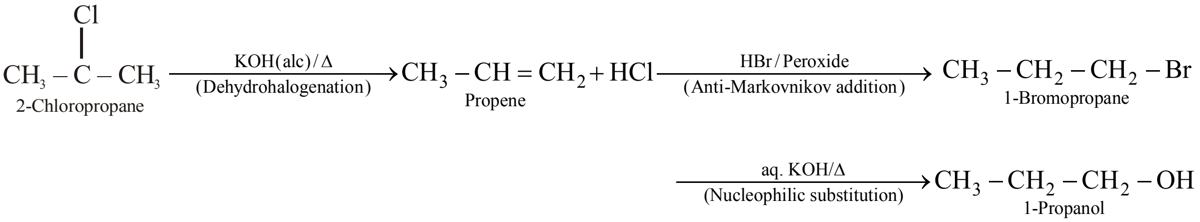
$$CH_3-\overset{\overset{CH_3}{|}}{C}=CH_2 \xrightarrow[\text{(Markovnikov addition)}]{HCl} CH_3-\underset{\underset{Cl}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_3$$

2-Methyl-1-propene 2-chloro-2-methylpropane

(xi) $\underset{\text{Ethylchloride}}{CH_3-CH_2-Cl} \xrightarrow[\text{(nucleophilic substitution)}]{\text{KCN. aq. ethanol}} \underset{\text{Propanenitrile}}{CH_3-CH_2-CN}+KCl \xrightarrow[H^+/H_2O]{\text{Hydrolysis}} \underset{\text{Propanoic acid}}{CH_3-CH_2-COOH}$

(xii) $\underset{\text{But-1-ene}}{CH_3-CH_2-CH=CH_2} \xrightarrow[\text{(Anti-Markovnikov addition)}]{HBr/\text{Peroxide}} \underset{\text{1-Bromobutane}}{CH_3-CH_2-CH_2-CH_2-Br} \xrightarrow[\text{NaI, dry acetone}]{\text{Finkelstein reaction}} \underset{\text{n−Butyliodide}}{CH_3-CH_2-CH_2-CH_2-I}$

(xiii)

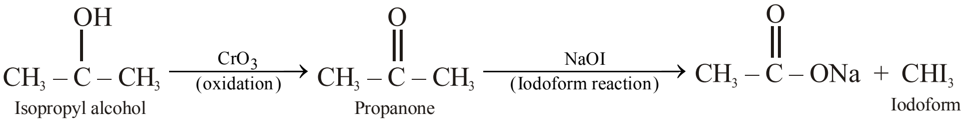


$$CH_3-\overset{\overset{Cl}{|}}{C}-CH_3 \xrightarrow[\text{(Dehydrohalogenation)}]{KOH(alc)/\Delta} \underset{\text{Propene}}{CH_3-CH=CH_2}+HCl \xrightarrow[\text{(Anti-Markovnikov addition)}]{HBr/\text{Peroxide}} \underset{\text{1-Bromopropane}}{CH_3-CH_2-CH_2-Br}$$

$$\xrightarrow[\text{(Nucleophilic substitution)}]{\text{aq. }KOH/\Delta} \underset{\text{1-Propanol}}{CH_3-CH_2-CH_2-OH}$$

2-Chloropropane

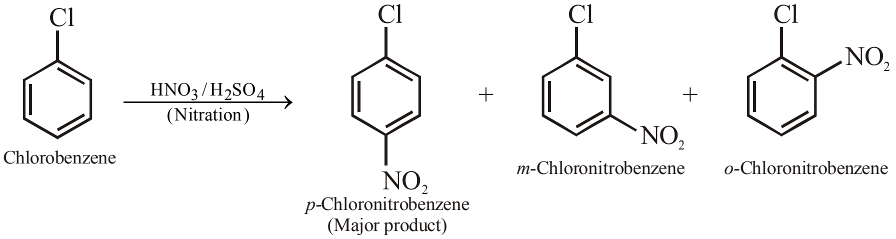
(xiv)



$$CH_3-\overset{\overset{OH}{|}}{C}-CH_3 \xrightarrow[\text{(oxidation)}]{CrO_3} CH_3-\overset{\overset{O}{\|}}{C}-CH_3 \xrightarrow[\text{(Iodoform reaction)}]{NaOI} CH_3-\overset{\overset{O}{\|}}{C}-ONa + CHI_3$$

Isopropyl alcohol Propanone Iodoform

(xv)



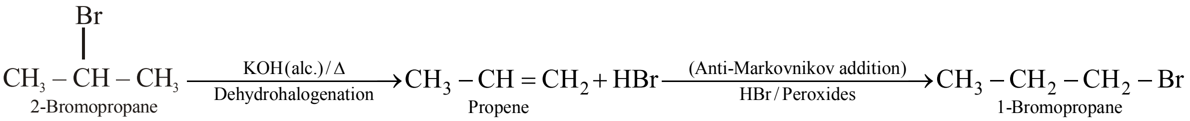
Chlorobenzene

p-Chloronitrobenzene
(Major product)

m-Chloronitrobenzene

o-Chloronitrobenzene

(xvi)

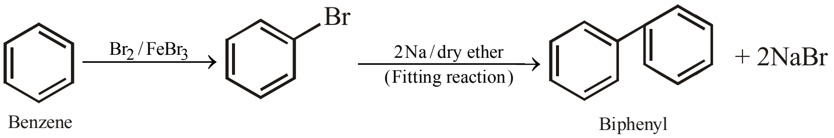


$$CH_3-\overset{\overset{Br}{|}}{CH}-CH_3 \xrightarrow[\text{Dehydrohalogenation}]{KOH(alc.)/\Delta} \underset{\text{Propene}}{CH_3-CH=CH_2}+HBr \xrightarrow[HBr/\text{Peroxides}]{\text{(Anti-Markovnikov addition)}} \underset{\text{1-Bromopropane}}{CH_3-CH_2-CH_2-Br}$$

2-Bromopropane

(xvii) $CH_3-CH_2-Cl \xrightarrow[\text{(Wurtz reaction)}]{2Na/\text{dry ether}} \underset{\text{Butane}}{CH_3-CH_2-CH_2-CH_3}+2NaCl$

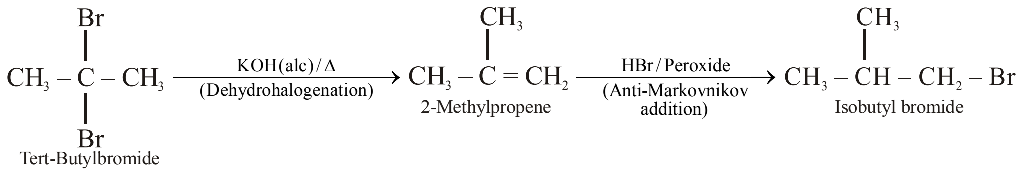
(xviii)



Benzene

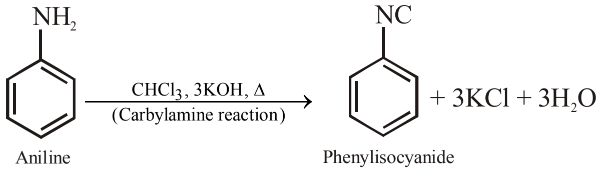
Biphenyl

(xix)



$$\underset{\text{Tert-Butylbromide}}{CH_3-\overset{\overset{Br}{|}}{\underset{\underset{Br}{|}}{C}}-CH_3}\xrightarrow[\text{(Dehydrohalogenation)}]{KOH(alc)/\Delta}\underset{\text{2-Methylpropene}}{CH_3-\overset{\overset{CH_3}{|}}{C}=CH_2}\xrightarrow[\text{(Anti-Markovnikov addition)}]{HBr/Peroxide}\underset{\text{Isobutyl bromide}}{CH_3-\overset{\overset{CH_3}{|}}{CH}-CH_2-Br}$$

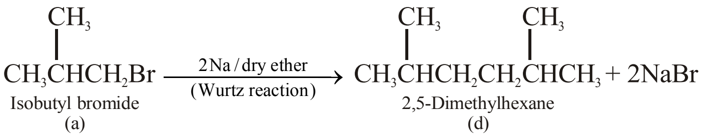
(xx)



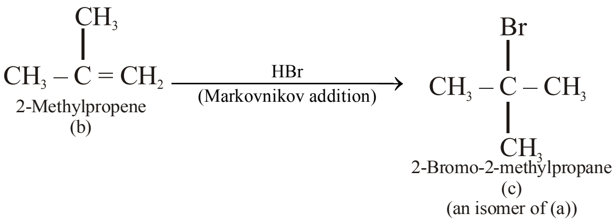
Q4. Primary alkyl halide C_4H_9Br (a) reacted with alcoholic KOH to give compound (b).Compound (b) is reacted with HBr to give (c) which is an isomer of (a). When (a) is reacted with sodium metal it gives compound (d), C_8H_{18}which is different from the compound formed when n-butyl bromide is reacted with sodium. Give the structural formula of (a) and write the equations for all the reactions.

Ans.

$$\underset{\text{n-Butyl bromide}}{2CH_3CH_2CH_2CH_2Br}\xrightarrow[\text{(Wurtz reaction)}]{2Na/\text{dry ether}}\underset{\text{n-Octane}}{CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_3}+2NaBr$$



$$\underset{\substack{\text{Isobutyl bromide}\\ \text{(a)}}}{CH_3\overset{\overset{CH_3}{|}}{C}HCH_2Br}\xrightarrow[\text{(Wurtz reaction)}]{2Na/\text{dry ether}}\underset{\substack{\text{2,5-Dimethylhexane}\\ \text{(d)}}}{CH_3\overset{\overset{CH_3}{|}}{C}HCH_2CH_2\overset{\overset{CH_3}{|}}{C}HCH_3}+2NaBr$$



$$\underset{\substack{\text{2-Methylpropene}\\ \text{(b)}}}{CH_3-\overset{\overset{CH_3}{|}}{C}=CH_2}\xrightarrow[\text{(Markovnikov addition)}]{HBr}\underset{\substack{\text{2-Bromo-2-methylpropane}\\ \text{(c)}\\ \text{(an isomer of (a))}}}{CH_3-\overset{\overset{Br}{|}}{\underset{\underset{CH_3}{|}}{C}}-CH_3}$$

PREVIOUS YEARS CBSE QUESTIONS

2012

1. Explain the mechanism of acid catalysed hydration of an alkene to form corrouspounding alcohol.
2. Answer the following questions:
   (i) What is meant by chirality of acompound? Give an Example.
   (ii) Which of the following compound is more easily hydrolysed by KOH and why?$CH_3CHClCH_2CH_3$ or $CH_3CH_2CH_2Cl$
   (iii) Which one undergoes SN2 substitution reaction faster and why? 

2011

1. Write the IUPAC name of the following compound :
   $(CH_3)_3CCH_2Br$
2. Answer the following :
   (*i*) Haloalkanes easily dissolve in organic solvents, why ?
   (*ii*) What is known as a racemic mixture? Give an example.
   (*iii*) Of the two bromoderivatives, $C_6H_5CH(CH_3)Br$ and $C_6H_5CH(C_6H_5)Br$, which one is more reactive in S_N1 substitution reaction and why?

2010

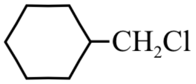
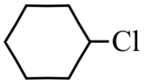
1. A solution of KOH hydrolyses $CH_3CHClCH_2CH_3$ and $CH_3CH_2CH_2Cl$. Which one of these is more easily hydrolysed?

2. How are the following conversions carried out?
(***i***) Benzyl chloride to benzyl alcohol, (***ii***) Methyl magnesium bromide to 2-methylpropan-2-ol

3. State one use each of DDT and iodoform.

2009

1. Which ones in the following pairs of substances undergoes S_N2 substitution reaction faster and why?

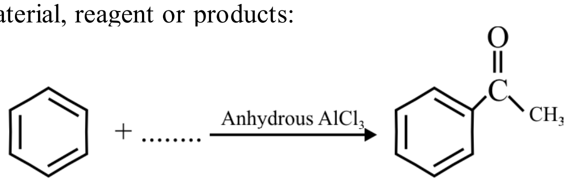
(*i*)  or 

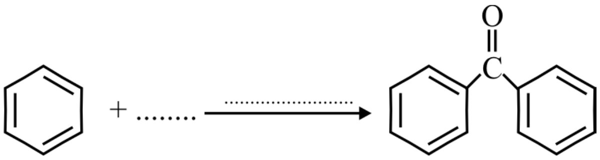
(*ii*)  or 

2. (*a*) How are the following obtained?
(*i*) Benzoic acid and ethyl benzene. (*ii*) benzldehyde from toluene

(*b*) Complete each systhesis by giving the missing material, reagent or products:

(*i*) $C_6H_5COCl \xrightarrow[\text{Pd-BaSO}_4]{H_2}$ ....

(*ii*) 

(*iii*) 

2008

1. Explain as to why haloarenes are much less reactive than haloalkanes towards nucleophilic substitution reactions.
(2 marks)

Hint:

Aryl halides contain a benzene ring. Typical reactions in this case are electrophilic substitution reactions.
Factors responsible for diminished reactivity of haloarenes towards nucleophilic reactions are:

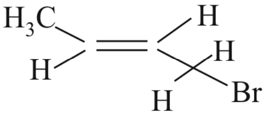
(*a*) Resonance effect (*b*) Difference in hybridisation of carbon atom in the C-X bond
(*c*) Instability of phenyl cation (*d*) Electronic repulsions

On the other hand, carbon carrying the halogen in haloalkanes is more electron deficient than in haloarenes. As a result haloalkanes undergo nucleophilic substitutions more readily than haloarenes.

2. Which compound in each of the following pairs will react faster in S_N2 reaction with –OH? Why? **(2 marks)**
(*i*) CH_3Br or CH_3I (*ii*) $(CH_3)_3CCl$ or CH_3Cl

Answer:

(*i*) CH_3I (*ii*) CH_3Cl

3. (*a*) State the IUPAC name of the following compound: 

(*b*) Complete the following chemical equations:
$CH_3CH_2CH{=}CH_2 + HBr$ Peroxide $\xrightarrow{H_2O_2}$

Answer:

(*a*) 1-Bromobut-2-ene (*b*) $CH_3CH_2CH_2{-}CH_2Br$