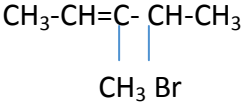
Chapter: 10 (Halo alkanes and Haloarene)

➢ One Mark Questions:

1. Give IUPAC name of the following organic compound:



2. Write the structural formulae of 4-Chloropent-2-ene.

Q3.Arrange the following halides in order of increasing SN^2 reactivity

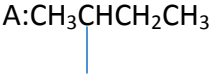
CH_3Cl,CH3Br,CH_3CH_2Cl, $(CH_3)_2CHCl$

Q5.What is the order of reactivity of different alkyl halides in nucleophilic substitution reaction?

Q4.An alkyl halide C_4H_9Cl is optically active. What is its structure?

Q7.Which type of solvents aregenerally used to carry out SN^1 reaction?

Q8.Identify the chiral and achiral molecules in following pair of compounds?

A: 

B :$CH_3CH_2CH_2CH_2Br$

Br

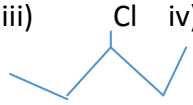
Q9.Give two uses of iodoform (CHI_3)?

Q10.Write a chemical reaction in which iodide ion displaces diazonium group from a diazonium salt?

Q11.How you will convert 2-Bromopropane to 1-bromopropane?

Q12.In following pairs of halogen compound which compound undergoes faster SN^1 reaction?

A) Cl i) 

Cl iii) Cl iv) ii) 

B) 

Cl

Q13.How you will convert aniline into cholobenzene?

Q14.Name the iodine containing hormone, the deficiency of which causes goiter?

Q15.Name the synthetic halogen compound which is used in treatment of malaria?

Q16.Which isomer of C_4H_9Br will have lowest boiling point?

Q17.Write the IUPAC name of DDT?

Q18.Why sulphuric acid is not used during reaction of alcohol with KI?

Q19.Out of CH_3Br and CH_3Cl which will have higher boiling point and why?

Q20.Which one of following has highest dipole moment?

(i) CH_2Cl_2 (ii) $CHCl_3$ (iii) CCl_4

➢ Two marks questions:

Q1.Define the following terms:

(i) Ambidient nucleophile (ii) Chirality

Q2.Write short note on sandmeyer reaction?

Q3.Write the structures of main products:

(i).Chlorination of benzene in presence of UV light.

(ii).Propene is treated with HBr in presence of benzoyl peroxide.

Q4.Complete the following reactions:

(i).$C_6H_5N_2Cl + KI \longrightarrow$?

(ii) $CH_2=CH_2 + Br_2 \xrightarrow{CCl_4}$?

Q5.Explain why haloarenes are much less reactive than haloalkanes towards nucleophilic substitution reaction?

Q6.Write short note on:

(i).Wurtz reaction

(ii).Wurtz-Fittig reaction.

Q7.How you will convert:

(i).Ethyl chloride into ethyl alcohol.

(ii).Ethyl chloride to ethane

Q8.Alkyl halides are insoluble in water though they contain polar C-X bond?

Q9.Give one test to distinguish between:

(i).Chloroform and carbontetrachloride

(ii).Methanol and ethanol.

Q10.Write short note on :

(i).Finkelstein reaction

(ii).Hundsdiecker reaction

- **Three Marks Questions:**

1.Explain why:

(a).Dipole moment of cholorobenzene is lower than cyclohexyl chloride.

(b).Grignard reagent should be prepared under anhydrous conditions?

(c).Chloroform is stored in dark Brown bottles?

Q2.What happens when:

(a).Chloroform is heated with silver power.

(b).Ethyl chloride treated with alcoholic KOH

(c).Alcohol reacts with thionyl chloride?

Q3.How you will conert:

(a).Chlorobenzene into toluene

(b).Chlorobenzene to phenol

(c).Ethyl bromide to diethyl ether.

Q4.Complete the following reactions:

(a).$CHCl_3 + CH_3COCH_3 \longrightarrow$?

(b).$CH_3CH_2CH_2Br + KOH(alc.) \longrightarrow$?

(c).$CHCl_3 + HNO_3 \xrightarrow{Heat}$?

Q5.Give the chemical test to distinguish between following pair of compounds:

(i)  and 

(ii) Ethyl chloride and ethyl bromide

(iii) Chlorobenzene and benyl chloride

Q6.Give reasons:

(i).Boiling point of alkyl bromide is higher than alkyl chloride.

(ii).Alkyl halides are better solvents than aryl halides.

(iii).Haloalkanesare used as solvent in industry are choloro compounds rather than bromo compounds.

Q7.Answer the following:

(i).What effect should the following resonance of vinyl chloride has on its dipole moment.

$CH_2=CH-Cl \; {}^{-}CH_2—CH=Cl^{+}\rightarrow$

(ii).Iodoform is obtained by the reactions of acetone with hypoiodite but not with iodide ion.

(iii).Vinyl chloride is hydrolysed more slowly than ethyl chloride.

Q8.Write the structure of major organic product in each of following reactions:

(i).CH_3-CH_2-CH_2-Cl +NaI $\xrightarrow{\text{Acetone}}$

(ii).CH_3-CH_2-CH_2OH +$SOCl_2$ $\longrightarrow$

(iii).$CH_3CH_2CH{=}CH_2$ +HBr $\xrightarrow{\text{Peroxide}}$

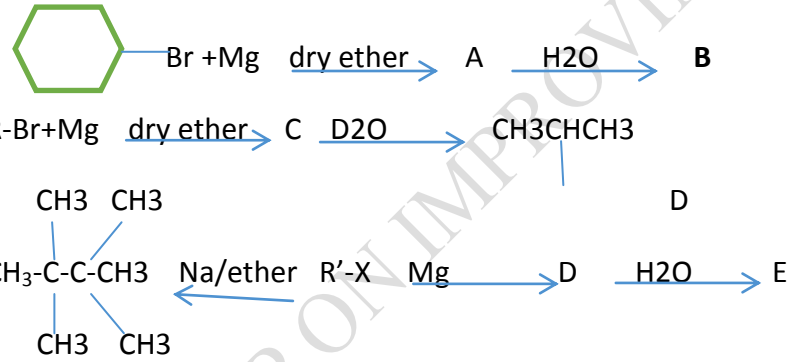
Q9.Give uses of following:

(i) CCl4
(ii) DDT
(iii) Choloroform

Q10.Distinguish between SN1 and SN2 reactions?

➢ Five Marks Question

1.Identify A,B,C,D,E,R,R' in the following:



2.What happens when:

(a).n-butyl chloride is treated with alcoholic KOH

(b).Bromonenzene is teated with Mg in presence of dry ether

(c).ethyl chloride is treated with aquous KOH

(d).Ethyl bromide is Na in presence of dry ether.

(e).Methyl chloride is treated with KCN

Q3.Primary alkyl halide A C_4H_9Br reacted with alcoholic KOH give compound B.Compound B is reacted with HBr to give C which ia an isomer of A.When A was reacted with Na metal it give a compound (D) C_8H_{18} that was different than the compound when n-butyl bromide reacted with sodium .Give the strural formulae for A and write the equations for all the reactions?

Q4.Write short note on:

(i).Fittig reaction

(ii).Friedal Craft Alkylation

(iii).Friedal Craft Acylation

(iv).Gatterman reaction

(v).Carbylaaminereation

Q5.Give reasons:

(i).Benzyl chloride undergoes SN1 reactions faster than cyclohexy methyl chloride.

(ii).p-Dichlorobenzene has higher melting point than ortho-dichlorobenzene.

(iii).Out of chlorobenzene and choloromethane ,which is more reactive towards nucleophilic substitution reaction?

(iv). Thionyl chloride is preffered for preparing alkyl chlorides from alcohols.

(V).Iodide ion is a better nucleophile than bromide ion?

Answer key

- **One Mark Question:**

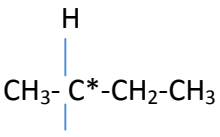
1.Ans:4-Bromo-3-methylpent-2-ene.

2.Ans:CH_3-CH=CH-CH_2-CH_3

Cl

3.Ans:($CH_3)_2CHCl<CH_3CH_2Cl,CH_3Cl<CH_3Br$

4.Ans:



Cl

5.Ans.RI>RBr>RCl

6.Ans:No

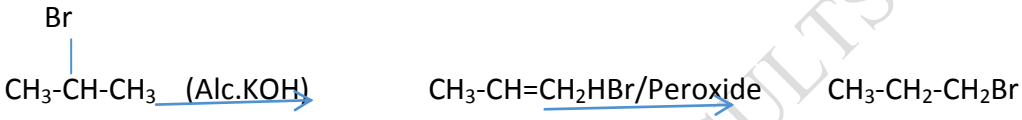
7.Ans: Polar protic solvents.

8.Ans: $CH_3CHCH_2CH_3$
Br

9.Ans: 1.As antiseptic 2.As photosensitizer in emulsion of AgBr to make photographic film.

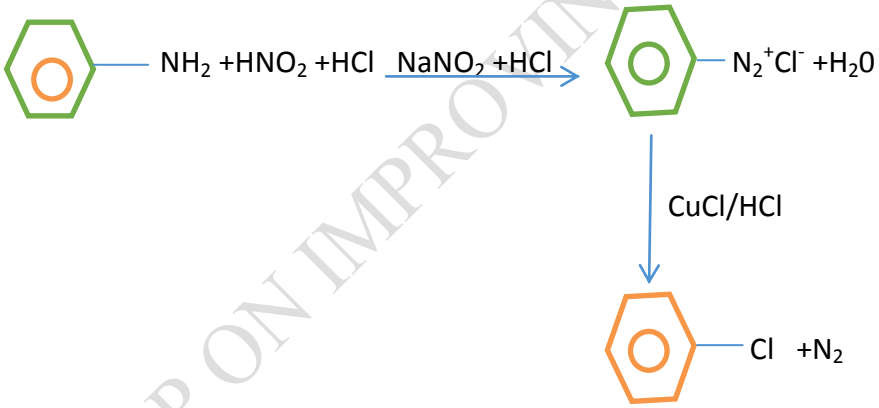
10.Ans: $C_6H_5\text{-}N^+_2Cl^- + KI \longrightarrow C_6H_5I + KCl + N_2\uparrow$

11.Ans:



12.Ans:A (i) B (iii)

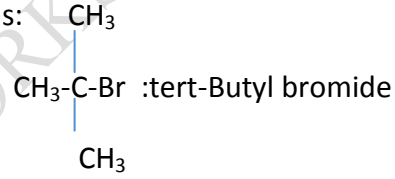
13.Ans:



14.Ans.Thyroxine

15.Ans:Chloroquine.

16.Ans:



:tert-Butyl bromide

17.Ans:2-(1,1-Dicholoro diphenyl)-1,1,1-tricholoroethane.

18.Ans:Because it first converts KI to HI and then oxidises it to I_2.

19.Ans:CH_3Br.More the molecular mass, more the boiling point.

20.Ans:CH_2Cl_2

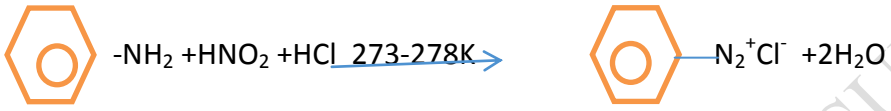
- **Two marks questions:**

1.(i)Ans:The nucleophiles having two nucleophiliccentres.For example Cyanide group.

-C≡N ⟷ :C=N-

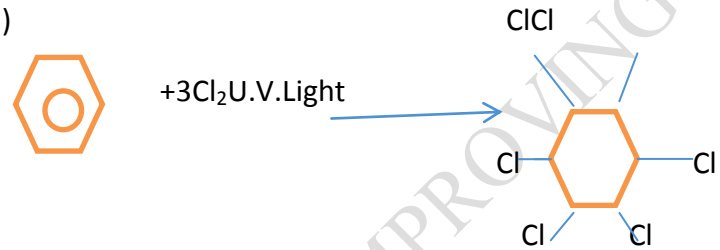
ii).An object which is not superimposable on its mirror image is said to be chiral.The property of being chiral is known as chirality.

2.Ans:$NaNO_2 + HCl \xrightarrow{273\text{-}278K} NaCl + HNO_2$



$C_6H_5N_2Cl \xrightarrow{CuCl/HCl} C_6H_5Cl + N_2$

3.Ans: i)



ii).$CH_3\text{-}CH{=}CH_2 + HBr \xrightarrow{Peroxide} CH_3\text{-}CH_2\text{-}CH_2\text{-}Br$

4.Ans : i) $C_6H_5N_2Cl + KI \rightarrow C_6H_5I + KCl + N_{2(g)}$

(ii).$CH_2{=}CH_2 + Br_2 \xrightarrow{CCl_4} CH_2BrCH_2Br$

5.Ans:1.Due to resonace C-Cl bond aquires double bond charcter .

ii.Inhaloarenes Carbon bearing halogen is sp2 hybirdised.So C-X bond is shorter and stronger.

6.Ans.(i) $RX + 2Na + X\text{-}R \xrightarrow{\text{Dry Ether}} R\text{-}R + 2NaX$

(ii).R-X +2Na + X  Dry ether  + 2NaX.

7.Ans (i).$C_2H_5Cl + KOH\ (aq) \rightarrow C_2H_5OH + KCl$

(ii).C_2H_5Cl +2[H] $\xrightarrow{Zn\text{-}Cu/C_2H_5OH}$ C_2H_6 +HCl

8.Ans:Because haloalkanes cannot form hydrogen bond with water molecules and at the same time they cannot break the hydrogen bonds present in water molecule.

9.Ans: (a). Chloroform when heated with aniline and alc.KOH offensive smeel of isocyanide is produced.

$C_6H_5NH_2$ +$CHCl_3$ +3KOH (alc.) heat $\longrightarrow$ C_6H_5NC +3KCl +$3H_2O$

(b).By iodoform test

In case of methanol no yellow ppt.But in case of ethanol yellow ppt are formed.

CH_3CH_2OH +4NaOI $\xrightarrow{NaOH+I_2}$ CHI_3+HCOONa +NaI+H_2O

CH_3OH +NaOI $\xrightarrow{NaOH+I_2}$ No yellow ppt

10.Ans.

(a). CH_3-CH_2-Cl +NaI $\xrightarrow{Acetone}$ CH_3-CH_2-I +NaCl

(b). RCOOAg +Br_2 $\xrightarrow{CCl_4,350K}$ R-Br+AgBr+$CO_{2(g)}$

➢ Three Marks question:

1.Ans. (a).Electronegativity of carbon is less than Chlorine so slight negative charge develops on chlorine atom and positive charge on carbon atom.Lower dipole moment of cholobenzene is due to (i) Resonace (ii).different hybirdisation states of C- atom

(b).Grignard reagent are very reactive.These are readily decomposed by compounds containing acidic hydrogen as follows

RMgX + H_2O $\longrightarrow$ RH +Mg(OH)X

(c).Because it reacts with oxygen in prsesnce of sunlight to form phosgene gas.

$CHCl_3$ + ½ O_2 $\xrightarrow{Sunlight}$ $COCl_2$ +HCl

2Ans.

(a).$CHCl_3$ +6Ag +CHC_{l3} $\longrightarrow$ 6AgCl +CH≡CH

(b).C_2H_5Cl +KOH (alc) $\longrightarrow$ CH_2=CH_2 +H_2O +KCl

(c).R-OH +$SOCl_2$ $\longrightarrow$ R-Cl+HCl+SO_2

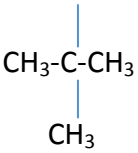
3Ans.How you will conert:

(a).$C_6H_5Cl + 2Na + Ch_3Cl$ dry ether $\rightarrow C_6H_5CH_3 + 2NaCl$

(b).  Cl NaOH,623K ONa $H_2O/H+$ OH

(c).$2C_2H_5Br + Ag_2O(dry) \rightarrow C_2H_5\text{-}O\text{-}C_2H_5 + 2AgBr$

Ans4.OH

(a).$CHCl_3 + CH_3COCH_3 \rightarrow$ 

(b).$CH_3CH_2CH_2Br + KOH(alc.) \rightarrow CH_3\text{-}CH{=}CH_2 + KBr + H_2O$

(c).$CHCl_3 + HNO_3 \xrightarrow{Heat} Cl_3C\text{-}NO_2 + H_2O$

Ans5.Give the chemical test to distinguish between following pair of compounds:

I)  Cl $+KOH(ag) + OH^-$ $\rightarrow$  $+KCl$

$KCl + AgNO_3 \rightarrow AgCl$ (White ppt)$+ KNO_3$

 Cl $+KOH(ag) \rightarrow$ No Reaction

ii) $C_2H_5Cl + KOH(aq) \rightarrow C_2H_5OH + KCl$

$KCl + AgNO_3 \rightarrow AgCl$ (White ppt)$+ KNO_3$ (soluble in NH4OH)

$C_2H_5Br + KOH(aq) \rightarrow C_2H_5OH + KBr$

$KBr + AgNO_3 \rightarrow AgBr$ (pale yellow ppt)$+ KNO_3$ (partially soluble in NH_4OH)

iii) $C_6H_5CH_2Cl + KOH(aq) \rightarrow C_6H_5CH_2OH + KCl$

$KCl + AgNO_3 \rightarrow AgCl$ (White ppt)$+ KNO_3$ (soluble in NH_4OH)

C6H5Cl+KOH(aq) $\rightarrow$ No reaction

Ans6.Give reasons:

(i).Beacuse of higher magnitude of Vander Waal's forces in alkyl bromide than alkyl halide.

(ii).Due to greater polarity of alkyl halides.

(iii).C-Cl bond is more polar than C-Br bond. So a better solvent than alkyl bromide.

Ans7.Answer the following:

i) $CH_2=CH-Cl^- \longleftrightarrow CH_2—CH=Cl^+$

It will decrease the dipole moment of vinyl chloride relative to ethyl chloride.

(ii).To prepare Iodoform from acetone I^+ is required. As I^+ can only be supplied IO^- not by I^-,therefore hypoiodite is used to convert acetone into iodoform.

(iii).Due to resonace there is double bond character between Carbon and chlorine.

Ans8.

(i).$CH_3-CH_2-CH_2-Cl + NaI \xrightarrow{Acetone} CH_3-CH2-CH_2-I + NaCl$

(ii).$CH_3-CH_2-CH_2OH + SOCl_2 \longrightarrow CH_3-CH_2-CH_2Cl + SO_2 + HCl$

(iii).$CH_3CH_2CH=CH_2 + HBr \xrightarrow{Peroxide} CH_3-CH_2-CH_2-CH_2Br$

Ans.9.Give uses of following:

i) CCl_4:Used as solvent.
ii) DDT:Used as insecticide
iii) Chloroform:Used as anesthesia in surgery.

Ans10.Distinguish between SN^1 and SN^2 reactions?

➢ Five Marks Question

Ans 1.

A=  MgBr: B=  : C=RMgBr

$R=CH_3CHCH_3$ $R'=C(CH_3)_3$: $D=C(CH_3)_3MgX$

$E=HC(CH_3)_3$

Ans2.What happens when:

(a).$CH_3-CH_2-CH_2-CH_2-Cl + KOH\ (alc) \longrightarrow CH_3-CH_2-CH=CH_2 + KCl + H_2O$

(b).$C_6H_5Br + Mg \xrightarrow{dry\ ether} C_6H_5MgBr$

(c).$C_2H_5Cl+KOH(aq) \longrightarrow C_2H_5OH+KCl$

(d).$2C_2H_5Br+2Na \xrightarrow{\text{dry ether}} CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_3 + 2NaBr$

(e).$CH_3Cl + KCN(alc) \longrightarrow CH_3CN + HCl$

Ans 3.A) $CH_3\text{-}CH(CH_3)\text{-}CH_2Br$ 1-Bromo-2-methylpropane.

B) $CH_3\text{-}C(CH_3)=CH_2$ 2-Methylprop-1-ene.

C) $CH_3\text{-}C(CH_3)(Br)\text{-}CH_3$ 2-Bromo-2-methylpropane

D) $CH_3\text{-}CH(CH_3)\text{-}CH_2\text{-}CH_2\text{-}CH(CH_3)\text{-}CH_3$ 2,5-Dimethylhexane

Equations for reaction:

$A \xrightarrow{\text{alc.KOH}} B$

$B+HBr \longrightarrow C$

$2A+2Na \longrightarrow D + 2NaBr$

4.Ans.

i).$C_6H_5Cl + 2Na + C_6H5Cl \longrightarrow C_6H_5\text{-}C_6H_5 + 2Nacl$

(ii).$C_6H_6 + CH_3Cl \xrightarrow{\text{(Anhyd)}AlCl_3} C_6H_5CH_3 + HCl$

iii).$C_6H_5Cl + CH_3COCl \xrightarrow{\text{Anhyd } AlCl_3} C_6H_5COCH_3$

iv) $C_6H_5N_2Cl \xrightarrow{Cu/HCl} C_6H_5Cl + N_2$

v) $CH_3CH_2NH_2 + CHCl_3 + KOH(alc.) \longrightarrow CH_3CH_2NC + 3KCl + 3H_2O$

A ns: 5.

(i).Because in case of benzyl chloride the carbocation is formed after the loss of Cl^- stabilized by resonance.

(ii).It is due to symmetry of p-Dichlorobenzene which fits in crystal lattice better than ortho-dichlorobenzene.

(iii).Chloromethane is more reactive being an alkyl halide

(iv). Thebyproducts of the reaction i.e.SO_2 and HCl being gases escape into the atmosphere leaving behind the alkyl chloride in almost pure state.

(V).Because of bigger size and lower electronegativity.