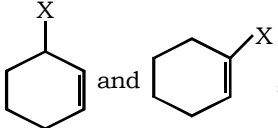
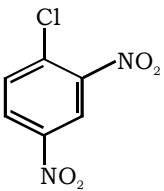
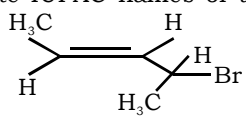
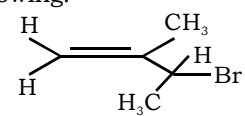
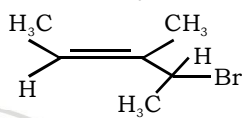
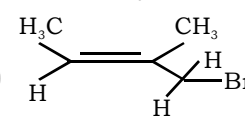
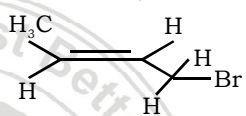
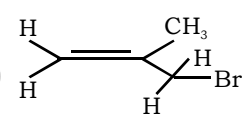
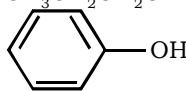
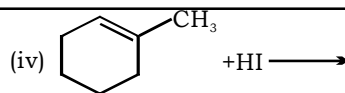
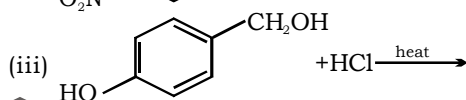
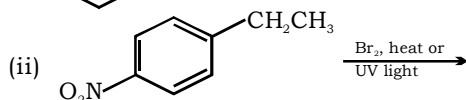
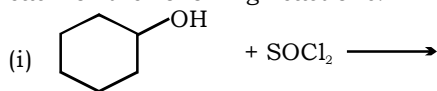


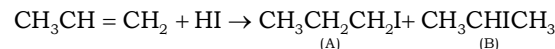
Instructor: **ER. S.K.SINGH (B. Tech, M.Tech M.N.N.I.T. Alld.)**

- Draw the structure of 4-tert-butyl-3-iodoheptane.
- Out of , which is an example of allylic halide?
 - Write the structure of 1-Bromo-4-chlorobut-2-ene.
 - Write the structure of 2-(2-Bromophenyl) butane.
 - Write IUPAC name of the following compound:
 $\text{CH}_2 = \text{CH} - \text{CH}_2 - \text{Br}$
 - Give the IUPAC name of the following compound:
 $\text{CH}_2 = \underset{\text{CH}_3}{\text{C}} - \text{CH}_2\text{Br}$
 - Write down the structure and IUPAC name for neo-pentylbromide.
 - Write the IUPAC name of the following compound:
 $\text{CH}_3 - \underset{\text{Br}}{\text{CH}} - \text{CH}_2 - \underset{\text{Cl}}{\text{CH}} - \text{CH}_3$
 - Write the IUPAC name of the following compound:

 - Write the isomers of the compound having formula $\text{C}_4\text{H}_9\text{Br}$.
 - Classify the following compounds as primary, secondary and tertiary halids.
 - 1-Bromobut-2-ene
 - 4-Bromopent-2-ene
 - 2-Bromo-2-methylpropane
 - Write structures of the following compounds:
 - 2-Chloro-3-methylpentane
 - 1-Chloro-4-ethylcyclohexane
 - 4-tert-Butyl-3-iodoheptane
 - 1,4-Dibromobut-2-ene
 - 1-Bromo-methylbenzene
 - Write the structure of the following organic halogen compounds.
 - 2-Chloro-3-methylpentane
 - p*-Bromochlorobenzene
 - 1-Chloro-4-ethylcyclohexane
 - 2-(2-Chlorophenyl)-1-iodooctane
 - Perfluorobenzene
 - 4-tert-Butyl-3-iodoheptane
 - 1-Bromo-4-sec-butyl-2-methylbenzene
 - 1, 4-Dibromobut-2-ene
 - Draw the structures of all the eight structural isomers that have the molecular formula $\text{C}_5\text{H}_{11}\text{Br}$. Name each isomer according to IUPAC system and classify them as primary, secondary or tertiary bromide.
 - Write IUPAC names of the following:
 - 
 - 
 - 
 - 
 - 
 - 
 - Name the following halides according to IUPAC system and classify them as alkyl, allyl, benzyl (primary, secondary, tertiary), vinyl or aryl halides:
 - $(\text{CH}_3)_2\text{CHCH}(\text{Cl})\text{CH}_3$
 - $\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}(\text{C}_2\text{H}_5)\text{Cl}$
 - $\text{CH}_3\text{CH}_2\text{C}(\text{CH}_3)_2\text{CH}_2\text{I}$
 - $(\text{CH}_3)_3\text{CCH}_2\text{CH}(\text{Br})\text{C}_6\text{H}_5$
 - $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}(\text{Br})\text{CH}_3$
 - $\text{CH}_3\text{C}(\text{C}_2\text{H}_5)_2\text{CH}_2\text{Br}$
 - $\text{CH}_3\text{C}(\text{Cl})(\text{C}_2\text{H}_5)\text{CH}_2\text{CH}_3$
 - $\text{CH}_3 - \text{CH} = \text{C}(\text{Cl})\text{CH}_2\text{CH}(\text{CH}_3)_2$
 - $\text{CH}_3\text{CH} = \text{CHC}(\text{Br})(\text{CH}_3)_2$
 - p*- $\text{ClC}_6\text{H}_4\text{CH}_2\text{CH}(\text{CH}_3)_2$
 - m*- $\text{ClCH}_2\text{C}_6\text{H}_4\text{CH}_2\text{C}(\text{CH}_3)_3$
 - o*- $\text{Br-C}_6\text{H}_4\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_3$
 - Give the IUPAC names of the following compounds:
 - $\text{CH}_3\text{CH}(\text{Cl})\text{CH}(\text{Br})\text{CH}_3$
 - $\text{CHF}_2\text{CBrClF}$
 - $\text{ClCH}_2\text{C} \equiv \text{CCH}_2 - \text{Br}$
 - $(\text{CCl}_3)_3\text{CCl}$
 - $\text{CH}_3\text{C}(\text{p-ClC}_6\text{H}_4)_2\text{CH}(\text{Br})\text{CH}_3$
 - $(\text{CH}_3)_3\text{CCH} = \text{CClC}_6\text{H}_4\text{I} - \text{p}$
 - Out of a bromide ion or an iodide ion, which is a better leaving group?
 - Amongst the isomeric alkanes of molecular formula C_5H_{12} , identify the one that on photochemical chlorination yields a single monochloride.
 - Under what conditions, 2-methylpropene can be converted into isobutyl bromide by the addition of HBr?
 - How can you obtain iodoethane from ethanol when no other iodine containing reagent except NaI is available in the laboratory?

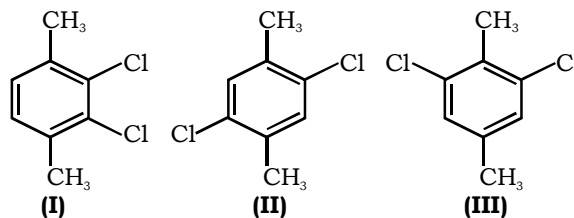
22. Why the haloalkanes extensively used as solvents in laboratory and industry are alkyl chlorides?
23. Name an antibiotic that contains chlorine.
24. How will you obtain monobromobenzene from aniline?
25. Diphenyls are potential threat to the environment. How are these produced from arylhalides?
26. Why is thionyl chloride preferred for preparing alkyl chloride from alcohols?
27. Identify all the possible monochloro structural isomers expected to be formed on free radical monochlorination of $(\text{CH}_3)_2\text{CHCH}_2\text{CH}_3$.
28. Discuss the nature of C - X bond in the haloarenes.
29. Why is sulphuric acid not used during the reaction of alcohols with KI?
30. Write structures of different dihalogen derivatives of propane.
31. Among the isomeric alkanes of molecular formula C_5H_{12} , identify the one that on photochemical chlorination yields
- A single monochloride
 - Three isomeric monochlorides
 - Four isomeric monochlorides
32. Write a test to detect the presence of double bond in a molecule.
33. Identify the products A and B formed in the following reaction:
- $$\text{CH}_3 - \text{CH}_2 - \text{CH} = \text{CH} - \text{CH}_3 + \text{HCl} \rightarrow \text{A} + \text{B}$$
34. Aryl chlorides and bromides can be easily prepared by electrophilic substitution of arenes with chlorine and bromine respectively in the presence of Lewis acid catalysts. But why does preparation of aryl iodides requires presence of an oxidising agent?
35. Discuss the role of Lewis acids in the preparation of aryl bromides and chlorides in the dark.
36. Which of the following compounds (a) and (b) will not react with a mixture of NaBr and H_2SO_4 . Explain why.
- $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
 - 
37. Predict the major product formed when HCl is added to isobutylene. Explain the mechanism involved.
38. A hydrocarbon of molecular mass 72 g mol^{-1} gives a single monochloro derivative and two dichloro derivatives on photo chlorination. Give the structure of the hydrocarbon.
39. Name the alkene which will yield 1-chloro-1-methyl cyclohexane by its reaction with HCl. Write the reactions involved.
40. Draw the structures of major monohalo products in each of the following reactions:



41. Which of the products will be major product in the reaction given below? Explain.

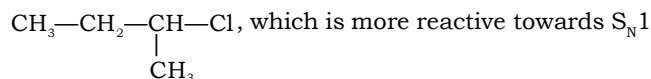


42. How can you convert the following? I-bromobutane to 1-iodobutane.
43. Write the equations for the preparation of 1-iodobutane from
- 1-butanol
 - 1-chlorobutane
 - but-1-ene
44. Out of *o*- and *p*-dibromobenzene which one has higher melting point and why?
45. Give reasons:
p-dichlorobenzene has higher melting point than those of *o* and *m*-isomers.
46. Why is the solubility of haloalkanes in water very low?
47. Give reasons:
n-butyl bromide has higher boiling point than *t*-butyl bromide.
48. Give reasons:
- C-Cl bond length in chlorobenzene is shorter than C-Cl bond length in CH_3Cl .
 - The dipole moment of chlorobenzene is lower than that of cyclohexyl chloride.
49. Arrange each set of compounds in order of increasing boiling points.
- Bromomethane, Bromoform, Chloromethane, Dibromomethane.
 - 1-Chloropropane, Isopropyl chloride, 1-Chlorobutane.
50. Explain why the dipole moment of chlorobenzene is lower than that of cyclohexyl chloride.
51. Which one of the following has the highest dipole moment?
- CH_2Cl_2
 - CHCl_3
 - CCl_4
52. *p*-Dichlorobenzene has higher m.p. and lower solubility than those of *o*- and *m*-isomers. Discuss.
53. Explain why
- the dipole moment of chlorobenzene is lower than that of cyclohexyl chloride?
 - alkyl halides, though polar, are immiscible with water?
54. Which of the following compounds will have the highest melting point and why?



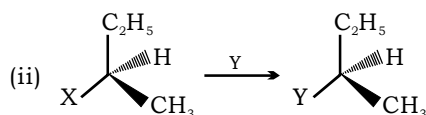
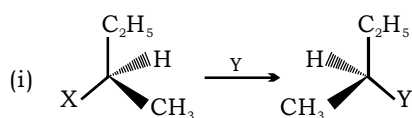
55. Alkyl halide reacts with Lithium aluminium hydride to give alkane. Name the attacking reagent which will bring out this change.
56. Give the IUPAC name of the product formed when:
- 2-Methyl-1-bromopropane is treated with sodium in the presence of dry ether.
 - 1-Methyl cyclohexene is treated with HI.
 - Chloroethane is treated with silver nitrite.
57. Give reasons: S_N1 reactions are accompanied by racemization in optically active alkyl halides.
58. How will you convert 2-Bromopropane to 1-Bromopropane?

59. Out of $\text{CH}_3-\underset{\text{CH}_3}{\text{CH}}-\text{CH}_2-\text{Cl}$ and

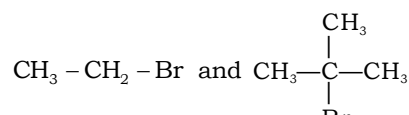


reaction and why?

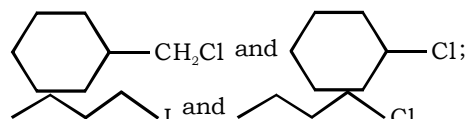
60. Which of the following two reaction is S_N2 and why?



61. Which would undergo S_N1 reaction faster in the following pair and why?



62. In the following pairs of halogen compounds, which would undergo S_N2 reaction faster?



63. Out of chlorobenzene and benzyl chloride, one gets easily hydrolysed by aqueous NaOH and why?
64. What are ambident nucleophiles? Explain with an example.
65. Allyl chloride can be distinguished from Vinyl chloride by NaOH and silver nitrate test. Comment.
66. How will you distinguish between ethyl bromide and Bromobenzene?
67. Which compound in each of the following pairs will react faster in S_N2 reaction with OH^- ?
- CH_3Br or CH_3I
 - $(\text{CH}_3)_3\text{CCl}$ or CH_3Cl
68. Which type of solvents are generally used to carry out S_N1 reactions?
69. How do polar solvents help in the first step in S_N1 mechanism?
70. The following compounds are given to you:
2-Bromopentane, 2-Bromo-2-methylbutane, 1-Bromopentane
- (a) Write the compound which is most reactive towards

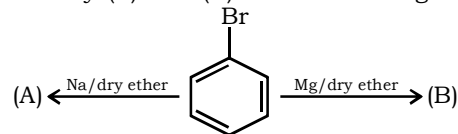
S_N2 reaction.

- Write the compound which is optically active.
- Write the compound which is most reactive towards β -elimination reaction.

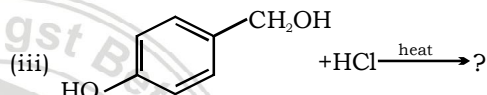
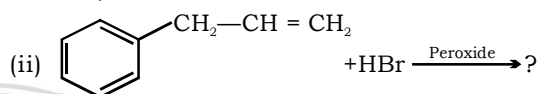
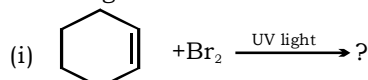
71. Predict the order of reactivity of the following compounds in S_N1 and S_N2 reactions:

- The four isomeric bromobutanes
- $\text{C}_6\text{H}_5\text{CH}_2\text{Br}$, $\text{C}_6\text{H}_5\text{CH}(\text{C}_6\text{H}_5)\text{Br}$, $\text{C}_6\text{H}_5\text{CH}(\text{CH}_3)\text{Br}$, $\text{C}_6\text{H}_5\text{C}(\text{CH}_3)(\text{C}_6\text{H}_5)\text{Br}$

72. Identify (A) and (B) in the following:



73. Write the major monohalo product(s) in each of the following reactions:



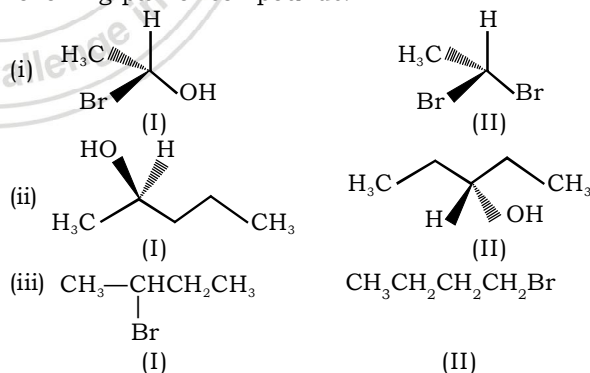
74. How do you convert the following?

- Prop-1-ene to 1-fluoropropane
- Chlorobenzene to 2-chlorotoluene
- Ethanol to propanenitrile

75. Write the main products when:

- n*-butyl chloride is treated with alcoholic KOH.
- 2, 4, 6-trinitrochlorobenzene is subjected to hydrolysis.
- Methyl chloride is heated with AgCN.

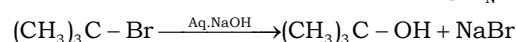
76. Identify chiral and achiral molecules in each of the following pair of compounds.



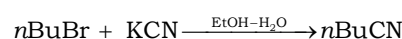
77. Which one of the compounds in the following pairs is chiral?



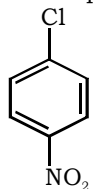
78. Write the mechanism of the following S_N1 reaction



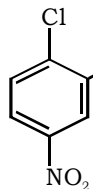
79. Write the mechanism of the following reaction:



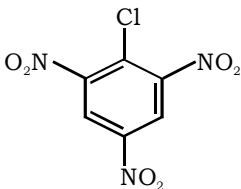
80. Aryl halides are extremely less reactive towards nucleophilic substitution. Predict and explain the order of reactivity of the following compounds towards nucleophilic substitution:



(I)

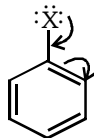


(II)

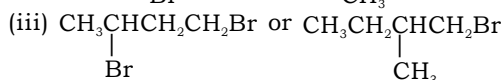
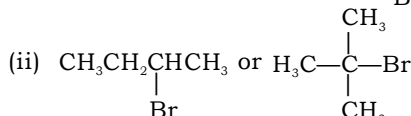


(III)

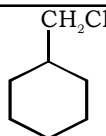
81. Explain why Grignard reagents should be prepared under anhydrous conditions?
82. Why is it necessary to avoid even traces of moisture during the use of a Grignard reagent?
83. Cyanide ion acts as an ambident nucleophile. From which end it acts as a stronger nucleophile in aqueous medium? Give reason for your answer.
84. Why can aryl halides not be prepared by reaction of phenol with HCl in the presence of $ZnCl_2$?
85. Give reasons for the following observations:
- Haloarenes are less reactive than haloalkanes towards nucleophilic substitution reaction.
 - The treatment of alkyl chloride with aqueous KOH leads to the formation of alcohol but in the presence of alcoholic KOH, alkene is the major product.
86. The treatment of alkyl chlorides with aqueous KOH leads to the formation of alcohols but in the presence of alcoholic KOH, alkenes are major products. Explain.
87. *tert*-Butylbromide reacts with aq. NaOH by S_N1 mechanism while *n*-butylbromide reacts by S_N2 mechanism. Why?
88. Draw other resonance structures related to the following structure and find out whether the functional group present in the molecule is ortho, para directing or meta directing.



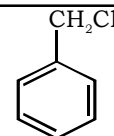
89. Although chlorine is an electron withdrawing group, yet it is *ortho*-, *para*-, directing in electrophilic aromatic substitution reactions. Why?
90. Which alkyl halide from the following pairs would you expect to react more rapidly by an S_N2 mechanism? Explain your answer.



91. Which of the following compounds would undergo S_N1 reaction faster and why?

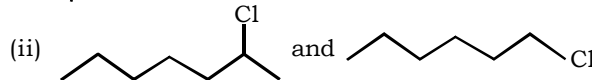
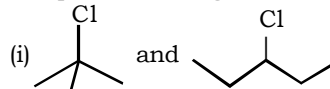


(A)

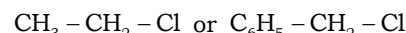


(B)

92. Allyl chloride is hydrolysed more readily than *n*-propyl chloride. Why?
93. In the following pairs of halogen compounds, which compound undergoes faster S_N1 reaction?



94. Which of the compounds will react faster in S_N1 reaction with the OH^- ion?



95. Arrange the compounds of each set in order of reactivity towards S_N2 displacement:

- 2-Bromo-2-methylbutane, 1-Bromopentane, 2-Bromopentane
- 1-Bromo-3-methylbutane, 2-Bromo-2-methylbutane, 3-Bromo-2-methylbutane
- 1-Bromobutane, 1-Bromo-2, 2-dimethylpropane, 1-Bromo-2-methylbutane, 1-Bromo-3-methylbutane.

96. Compound 'A' with molecular formula C_4H_9Br is treated with aq. KOH solution. The rate of this reaction depends upon the concentration of the compound 'A' only. When another optically active isomer 'B' of this compound was treated with aq. KOH solution, the rate of reaction was found to be dependent on concentration of compound and KOH both.

- Write down the structural formula of both compounds 'A' and 'B'.
- Out of these two compounds, which one will be converted to the product with inverted configuration.

97. Out of $C_6H_5CH_2Cl$ and $C_6H_5CHClC_6H_5$, which is more easily hydrolysed by aqueous KOH?

98. Haloarenes are less reactive than haloalkanes and haloalkenes. Explain.

99. An optically active compound having molecular formula $C_7H_{15}Br$ reacts with aqueous KOH to give a racemic mixture of products. Write the mechanism involved in this reaction.

- 100 Which of the following haloalkanes reacts with aqueous KOH most easily? Explain giving reason.

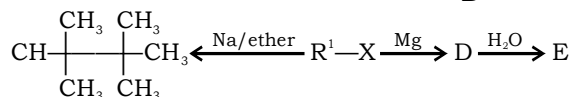
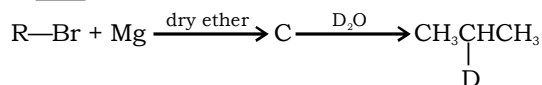
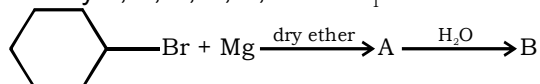
- 1-Bromobutane
- 2-Bromobutane
- 2-Bromo-2-methylpropane
- 2-Chlorobutane

- 101 Write the structure and names of the compounds formed when compound 'A' with molecular formula, C_7H_8 is treated with Cl_2 in the presence of $FeCl_3$.

- 102 Give reasons:

- Racemic mixture is optically inactive.
- The presence of nitro group ($-NO_2$) at *o/p* positions increases the reactivity of haloarenes towards

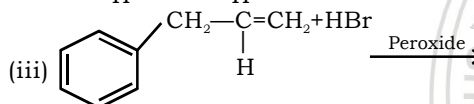
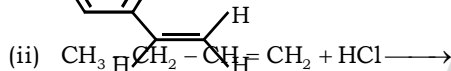
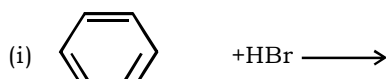
nucleophilic substitution reactions.

103 Identify A, B, C, D, E, R and R₁ in the following:104 A hydrocarbon C₅H₁₀ does not react with chlorine in dark but gives a single monochloro compound C₅H₉Cl in bright sunlight. Identify the hydrocarbon.

105 Elimination reaction (especially β-elimination) are as common as the nucleophilic substitution reaction in case of alkylhalides. Specify the reagents used in both cases.

106 Haloalkanes react with KCN to form alkyl cyanides as main product while AgCN forms isocyanides as the chief product. Explain.

107 Write the products of the following reactions:

108 Primary alkyl halide C₄H₉Br (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), C₈H₁₈ which is different from the compound formed when n-butylbromide is reacted with sodium. Give the structural formula of (a) and write the equations for all the reactions.

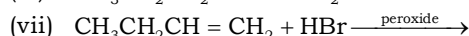
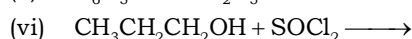
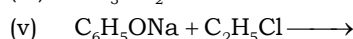
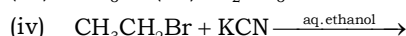
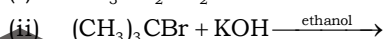
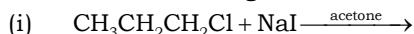
109 Predict all the alkenes that would be formed by dehydrohalogenation of the following halides with sodium ethoxide in ethanol and identify the major alkene:

- 1-Bromo-1-methylcyclohexane
- 2-Chloro-2-methylbutane
- 2, 2, 3-Trimethyl-3-bromopentane

110 What happens when

- n-butyl chloride is treated with alcoholic KOH,
- bromobenzene is treated with Mg in the presence of dry ether.
- Chlorobenzene is subjected to hydrolysis,
- ethyl chloride is treated with aqueous KOH,
- methyl bromide is treated with sodium in the presence of dry ether,
- methyl chloride is treated with KCN.

111 Write the structure of the major organic product in each of the following reaction:

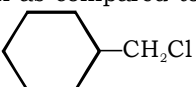
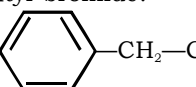


112 How will you bring about the following conversions?

- Ethanol to but-1-yne
- Ethane to bromoethene
- Propene to 1-nitropropane
- Toluene to benzyl alcohol
- Propene to propyne
- Ethanol to ethyl fluoride
- Bromomethane to propanone
- But-1-ene to but-2-ene
- 1-Chlorobutane to n-octane
- Benzene to biphenyl

113 How the following conversions can be carried out?

- Propene to propan-1-ol
- Ethanol to but-1-yne
- 1-Bromopropane to 2-bromopropane
- Toluene to benzyl alcohol
- Benzene to 4-bromonitrobenzene
- Benzyl alcohol to 2-phenylethanoic acid
- Ethanol to propanenitrile
- Aniline to chlorobenzene
- 2-Chlorobutane to 3, 4-dimethylhexane
- 2-Methyl-1-propene to 2-chloro-2methylpropane
- Ethyl chloride to propanoic acid
- But-1-ene to n-butyl iodide
- 2-Chloropropane to 1-propanol
- Isopropyl alcohol to iodoform
- Chlorobenzene to p-nitrophenol
- 2-Bromopropane to 1-bromopropane
- Chloroethane to butane
- Benzene to biphenyl
- tert-butyl bromide to isobutyl bromide
- Aniline to phenylisocyanide

114 Why is t-butyl bromide more reactive towards S_N1 reaction as compared to n-butyl bromide?115 Out of  and , whichwill react faster in S_N1 reaction with OH⁻?

116 What is pyrene?

117 What are freons?

118 Give an example of Freon. Write its use also.

119 Why is chloroform stored in closed dark coloured bottles?

120 State one use of

- DDT
- Iodoform

121 Write the equation involved in the preparation of DDT from chlorobenzene?

122 Give the uses of freon 12, DDT, carbon tetrachloride and iodoform.

123 Why iodoform has appreciable antiseptic property?

124 What are the IUPAC names of the insecticide DDT and benzenehexachloride? Why is their use banned in India and other countries?