

HALOALKANES AND HALOARENES

REVIEW EXERCISES

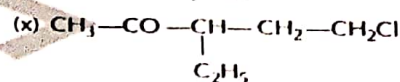
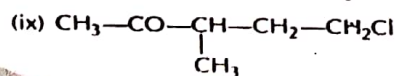
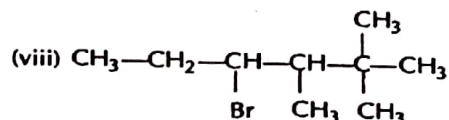
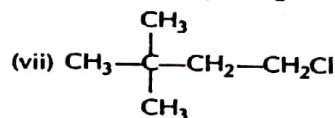
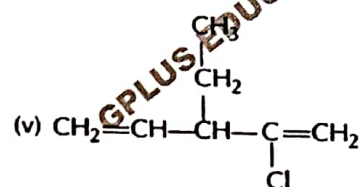
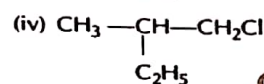
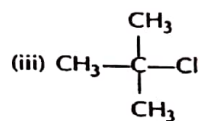
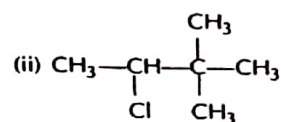
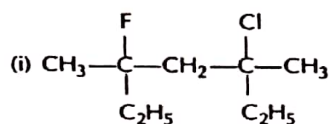
- 10.1 What are haloalkanes and how are they classified?
 10.2 What do you understand by a 3° alkyl halide? Give an example.
 10.3 What is the main structural difference between 1° and 2° alkyl halides?
 10.4 Write the structures of the following : (a) Vinyl chloride, (b) Allyl chloride.
 10.5 Write the structures of a chloroalkene and a chloroalkyne.

- 10.6 Write the structural formula and IUPAC names of the following compounds.

- (i) *n*-propyl chloride (ii) *iso*-butyl chloride
 (iii) *sec*-butyl chloride (iv) *iso*-amyl chloride
 (v) *neo*-pentyl chloride

[Ans. IUPAC names : (i) 1-chloropropane
 (ii) 1-chloro-2-methylpropane (iii) 2-chlorobutane
 (iv) 1-chloro-3-methylbutane
 (v) 1-chloro-2, 2-dimethylpropane]

- 10.7 Give the IUPAC names of the following compounds.



[Ans. (i) 1-chloro-5-fluoro-5-dimethylheptane (ii) 2-chloro-3, 3-dimethylbutane
 (iii) 2-chloro-2-methylpropane (iv) 1-chloro-2-methylbutane (v) 2-chloro-3-ethylpenta-1, 4-diene
 (vi) 1-chloro-3, 3-dimethylbutane (vii) 1-chloro-3-dimethylbutane (viii) 3-bromo-4, 5-trimethylhexane (ix) 5-chloro-4-methylpentan-2-one (x) 5-chloro-3-ethylpentan-2-one]

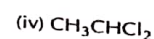
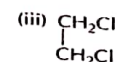
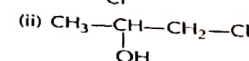
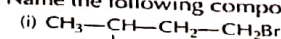
- 10.8 Write the structures of the following compounds and identify them as 1°, 2° or 3° halides.

- (i) 2-chloro-2-methylbutane
 (ii) 2-iodobutane
 (iii) 1-bromo-2-methylpropane
 (iv) 1-chloro-2, 2-dimethylpropane
 (v) chloroethane

[Ans. 1° : (iii), (iv), (v); 2° : (ii); 3° : (i), (v)]

- 10.9 Write all the possible chain and position isomers of the compounds having formula $\text{C}_5\text{H}_{11}\text{Cl}$. Write their IUPAC names and identify them as 1°, 2° and 3° halides.

- 10.10 Name the following compounds in IUPAC system:



[Ans. (i) 1-bromo-3-chlorobutane
 (ii) 1-chloropropan-2-ol (iii) 1, 2-dichloroethane
 (iv) 1, 1-dichloroethane (v) Trichloromethane
 (vi) Tetrachloromethane]

10.36 Chloroform is a chlorine compound, but it does not give white precipitate with silver nitrate solution. Give reasons.

10.37 What happens when chloroform is

- (i) treated with phenol in the presence of alcoholic KOH at 340 K;
- (ii) boiled with aqueous KOH;
- (iii) heated with silver powder;
- (iv) treated with aniline in the presence of alcoholic KOH?

10.38 What precautions are necessary to be taken for the safe storage of chloroform?

10.39 How would you distinguish following pairs of compounds?

- (i) Methanol and ethanol
- (ii) n-propyl alcohol and iso-propyl alcohol.

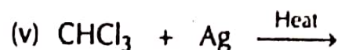
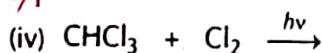
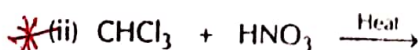
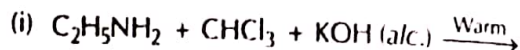
10.40 What happens when

- (i) iodoform is heated with caustic potash;
- (ii) chloroform is treated with acetone;
- (iii) carbon tetrachloride is heated with dry hydrogen fluoride in the presence of antimony pentachloride?

10.41 Explain the following :

- (i) The use of carbon tetrachloride as fire extinguisher is not very safe.
- (ii) Chloroform is not used as an anaesthetic now a days.
- (iii) A small amount of ethanol should be added to chloroform before its packaging.

10.42 Complete the following reactions :



10.43 How would you convert

- (i) iodoform to acetylene;
- (ii) carbon tetrachloride to chloroform;
- (iii) acetone to chloroform;
- (iv) chloroform to diethyl carbonate;
- (v) propanone to iodoform?

10.44 What is iodoform test and how is it carried out? What is its significance in organic chemistry?

10.45 Write the reactions involved in the preparation of iodoform from propan-2-ol.

10.46 What is freon and how is it prepared? What are the limitations for its use as a refrigerant?

10.47 Starting from chloroform how would you prepare?

- (i) acetylene
- (ii) propyne

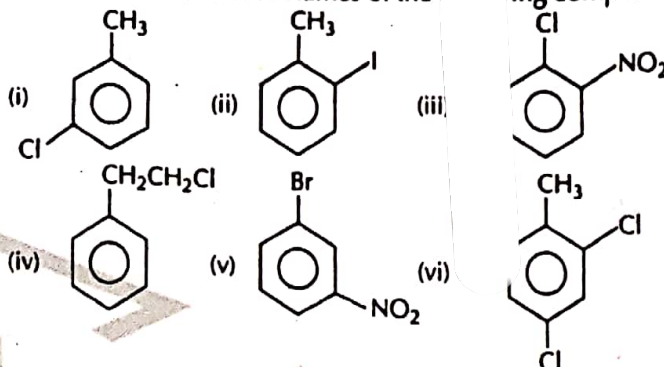
(iii) chloropicrin.

10.48 A sweet smelling organic compound (A) is slowly oxidised by air in the presence of light to a highly poisonous gas. On warming with silver powder, it forms a gaseous substance (B) which is also formed by the action of calcium carbide on water. Identify (A) and (B), and write the chemical equations of the reactions involved.

10.49 How is pure chloroform prepared and (how is it stored?)

10.50 How is ethyl bromide prepared in the laboratory? Describe its important synthetic applications.

10.51 Write the IUPAC names of the following compounds.



[Ans. (i) 3-chlorotoluene (ii) 2-iodotoluene (iii) 2-chloronitrobenzene (iv) 1-chloro-2-phenylethane (v) 3-bromonitrobenzene (vi) 2, 4, 6-trichlorotoluene]

10.52 Write the structural formula and give the IUPAC names of the following :

- (i) o-bromotoluene
- (ii) Benzyl chloride
- (iii) Benzotrichloride
- (iv) o-chlorobenzene sulphonic acid

[Ans. (i) 2-bromo-1-methylbenzene or 2-bromotoluene (ii) Chlorophenylmethane (iii) Trichlorophenylmethane (iv) 2-chlorobenzenesulphonic acid]

10.53 Describe a method for the preparation of haloarenes from diazonium salts.

10.54 Describe a method for the preparation of haloarenes from benzene.

10.55 How many isomers are possible for the compound C_7H_7Cl ? Write their structures and give their IUPAC names.

[Ans. 2-chlorotoluene, 3-chlorotoluene, 4-chlorotoluene, Chlorophenylmethane]

10.56 Why do alkyl halides (haloalkanes) undergo hydrolysis more easily than aryl halides (haloarenes)?

10.57 Account for the fact that halogen in chlorobenzene is less reactive than in methyl chloride.

10.58 Why are aryl halides less reactive than alkyl halides towards nucleophilic substitution reactions?

10.59 Arrange the following compounds in the order of increasing reactivity towards nucleophilic substitution reactions :

- (a) Chlorobenzene
- (b) 2, 4-dinitrochlorobenzene
- (c) 4-nitrochlorobenzene
- (d) 2, 4, 6-trinitrochlorobenzene

[Ans. (a) < (c) < (b) < (d)]

10.60 Explain the following briefly.

- (i) In chlorobenzene, the electrophilic substitution takes place at *o*- and *p*-positions.
- (ii) Allyl chloride is hydrolysed readily as compared to 1-chloropropane.
- (iii) Vinyl chloride is less reactive than ethyl chloride.
- (iv) The electrophilic substitution reactions in haloarenes occur slowly as compared to those in benzene.

10.61 What happens when :

- (i) chlorobenzene is treated with ethyl chloride in the presence of sodium in dry ether;
- (ii) chlorobenzene is heated with aqueous ammonia in the presence of cuprous oxide at 475K and under high pressure;
- (iii) iodobenzene is heated with copper powder in a sealed tube;
- (iv) benzene diazonium chloride is treated with an aqueous solution of potassium iodide;
- (v) chlorine is passed in boiling toluene in the presence of sunlight?

10.62 Write the resonance structures of chlorobenzene and explain why it is less reactive than chloroethane towards nucleophiles. Explain whether chloroethene should be more or less reactive than chloroethane towards nucleophiles.

10.63 Account for the following :

- (i) Haloalkanes are more reactive than haloarenes.
- (ii) Haloalkanes undergo nucleophilic substitution whereas haloarenes undergo electrophilic substitution.

10.64 Give the structures and names of the products in the following reactions.

- (i) Chlorination of toluene in the presence of anhydrous AlCl_3 ;
- (ii) Sulphonation of chlorobenzene;
- (iii) Nitration of bromobenzene;
- (iv) Friedel-Crafts methylation of chlorobenzene.

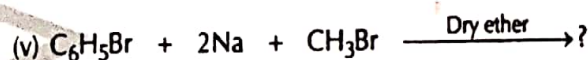
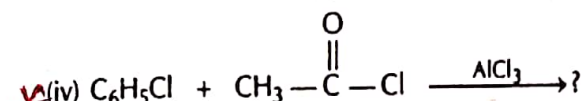
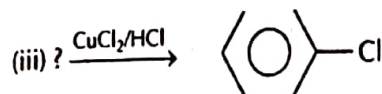
10.65 How will you distinguish $\text{C}_2\text{H}_5\text{Br}$ from $\text{C}_6\text{H}_5\text{Br}$?

10.66 What is Sandmeyer's reaction? Illustrate with a suitable example.

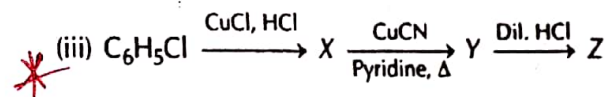
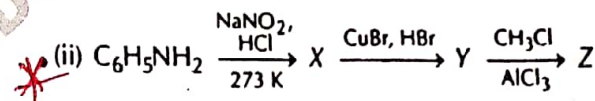
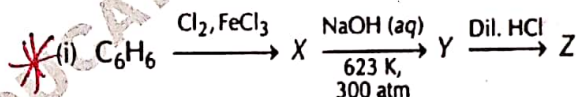
10.67 How are the following conversions carried out?

- (i) Chlorobenzene to benzoic acid
- (ii) Chlorobenzene to benzene
- (iii) Aniline to chlorobenzene
- (iv) Chlorobenzene to phenol
- (v) Chlorobenzene to benzylamine
- (vi) Chlorobenzene to aniline.

10.68 Complete the following chemical equations.



10.69 Identify X, Y and Z in the following sequence of reactions.



10.70 How will you distinguish between the following pair of compounds?

- (i) Chlorobenzene and benzyl chloride
- (ii) *o*-chlorotoluene and benzyl chloride
- (iii) Bromobenzene and benzyl bromide
- (iv) Ethyl bromide and bromobenzene.

10.71 Give one example of each of the following reactions

- (i) Wurtz Reaction
- (ii) Wurtz-Fittig Reaction