



## NCERT EXERCISES

10.1. Name the following halides according to IUPAC system and classify them as alkyl, allyl, benzyl (primary, secondary, tertiary), vinyl or aryl halides:

- (i)  $(\text{CH}_3)_2\text{CHCH}(\text{Cl})\text{CH}_3$
- (ii)  $\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}(\text{C}_2\text{H}_5)\text{Cl}$
- (iii)  $\text{CH}_3\text{CH}_2\text{C}(\text{CH}_3)_2\text{CH}_2\text{I}$
- (iv)  $(\text{CH}_3)_3\text{CCH}_2\text{CH}(\text{Br})\text{C}_6\text{H}_5$
- (v)  $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}(\text{Br})\text{CH}_3$
- (vi)  $\text{CH}_3\text{C}(\text{C}_2\text{H}_5)_2\text{CH}_2\text{Br}$
- (vii)  $\text{CH}_3\text{C}(\text{Cl})(\text{C}_2\text{H}_5)\text{CH}_2\text{CH}_3$
- (viii)  $\text{CH}_3\text{CH}=\text{C}(\text{Cl})\text{CH}_2\text{CH}(\text{CH}_3)_2$
- (ix)  $\text{CH}_3\text{CH}=\text{CHC}(\text{Br})(\text{CH}_3)_2$
- (x)  $p\text{-ClC}_6\text{H}_4\text{CH}_2\text{CH}(\text{CH}_3)_2$
- (xi)  $m\text{-ClCH}_2\text{C}_6\text{H}_4\text{CH}_2\text{C}(\text{CH}_3)_3$
- (xii)  $o\text{-Br-C}_6\text{H}_4\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_3$

Ans:

- (i) 2-Chloro-3-methylbutane, 2° alkyl halide
- (ii) 3-Chloro-4-methyl hexane, 2° alkyl halide
- (iii) 1-Iodo-2,2-dimethylbutane, 1° alkyl halide
- (iv) 1-Bromo-3, 3-dimethyl -1-phenylbutane, 2° benzylic halide
- (v) 2-Bromo-3-methylbutane, 2° alkyl halide
- (vi) 1-Bromo-2-ethyl-2-methylbutane, 1° alkyl halide
- (vii) 3-Chloro-3-methylpentane, 3° alkyl halide
- (viii) 3-Chloro-5-methylhex-2-ene, vinylic halide
- (ix) 4-Bromo-4-methylpent-2-ene, allylic halide
- (x) 1-Chloro-4-(2-methylpropyl) benzene, aryl halide
- (xi) 1-Chloromethyl-3- (2,2-dimethylpropyl) benzene, 1° benzylic halide.
- (xii) 1-Bromo-2-(1-methylpropyl) benzene, aryl halide.

10.2. Give the IUPAC names of the following compounds:

- (i)  $\text{CH}_3\text{CH}(\text{Cl})\text{CH}(\text{Br})\text{CH}_3$
- (ii)  $\text{CHF}_2\text{CBrClF}$
- (iii)  $\text{ClCH}_2\text{C}=\text{CCH}_2\text{Br}$
- (iv)  $(\text{CCl}_3)_3\text{CCl}$
- (v)  $\text{CH}_3\text{C}(p\text{-ClC}_6\text{H}_4)_2\text{CH}(\text{Br})\text{CH}_3$
- (vi)  $(\text{CH}_3)_3\text{CCH}=\text{C}(\text{Cl})\text{C}_6\text{H}_4\text{-p}$

Ans:

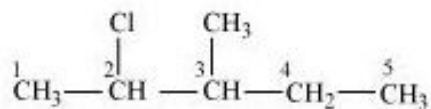
- (i) 2-Bromo-3-chlorobutane
- (ii) 1-Bromo-1-chloro-1,2,2-trifluoroethane
- (iii) 1-Bromo-4-chlorobut-2-yne
- (iv) 2-(Trichloromethyl)-1, 1,1,2,3,3,3- heptachloropropane
- (v) 2-Bromo-3,3-bis-(4-chlorophenyl) butane
- (vi) 1-Chloro-1-(4-iodophenyl)-3,3- dimethylbut-1-ene.

10.3. Write the structures of the following organic halogen compounds:

- (i) 2-Chloro-3-methylpentane
- (ii) p-Bromochlorobenzene
- (iii) 1-Chloro-4-ethylcyclohexane
- (iv) 2-(2-Chlorophenyl)-1-iodooctane
- (v) 2-Bromobutane
- (vi) 4-tert-Butyl-3-iodoheptane
- (vii) 1-Bromo-4-sec-butyl-2-methylbenzene
- (viii) 1,4-Dibromobut-2-ene

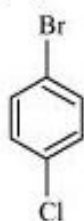
Ans:

(i)



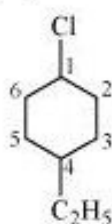
2-Chloro-3-methylpentane

(ii)



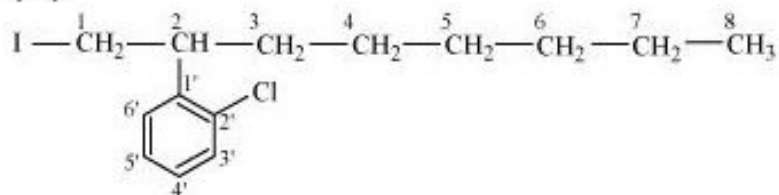
p-Bromochlorobenzene

(iii)



1-Chloro-4-ethylcyclohexane

(iv)



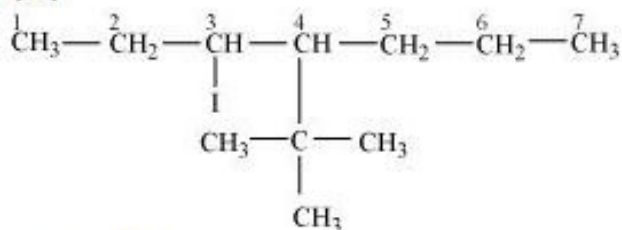
2-(2-Chlorophenyl)-1-iodooctane

(v)



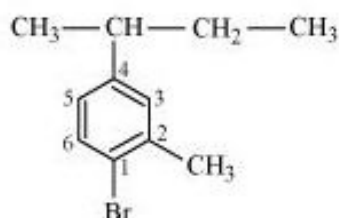
Perfluorobenzene

(vi)



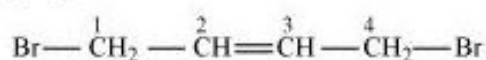
4-Tert-Butyl-3-iodoheptane

(vii)



1-Bromo-4-sec-butyl-2-methylbenzene

(viii)

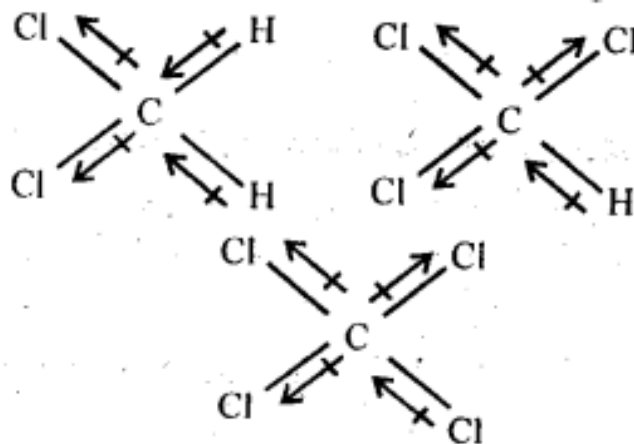


1,4-Dibromobut-2-ene

10.4. Which one of the following has the highest dipole moment?

(i)  $\text{CH}_3\text{Cl}_2$  (ii)  $\text{CHCl}_3$  (iii)  $\text{CCl}_4$

Ans: The three dimensional structures of the three compounds along with the direction of dipole moment in each of their bonds are given below:



$\text{CCl}_4$  being symmetrical has zero dipole moment. In  $\text{CHCl}_3$ , the resultant of two C - Cl dipole moments is opposed by the resultant of C - H and C - Cl bonds. Since the dipole moment of latter resultant is expected to be smaller than the former,  $\text{CHCl}_3$  has a finite dipole (1.03 D) moment.

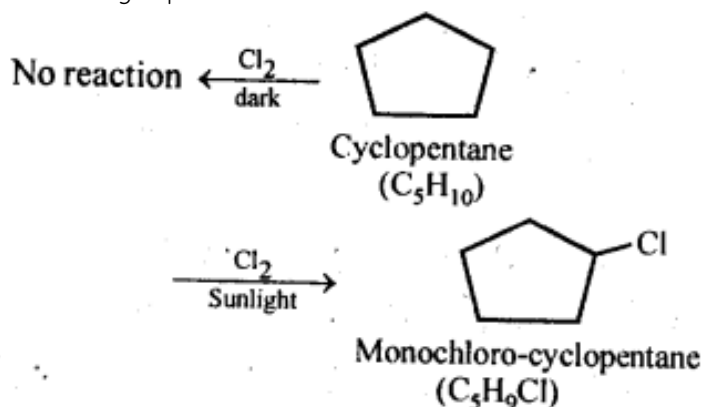
In  $\text{CH}_2\text{Cl}_2$ , the resultant of two C - Cl dipole moments is reinforced by resultant of two C - H dipoles, therefore,  $\text{CH}_2\text{Cl}_2$  (1.62 D) has a dipole moment higher than that of  $\text{CHCl}_3$ . Thus,  $\text{CH}_2\text{Cl}_2$  has highest

dipole moment.

10.5. A hydrocarbon  $C_5H_{10}$  does not react with chlorine in dark but gives a single monochloro compound  $C_5H_9Cl$  in bright sunlight. Identify the hydrocarbon.

Ans: The hydrocarbon with molecular formula  $C_5H_{10}$  can either be a cycloalkane or an alkene.

Since the compound does not react with  $Cl_2$  in the dark, therefore it cannot be an alkene but must be a cycloalkane. Since the cycloalkane reacts with  $Cl_2$  in the presence of bright sunlight to give a single monochloro compound,  $C_5H_9Cl$ , therefore, all the ten hydrogen atoms of the cycloalkanes must be equivalent. Thus, the cycloalkane is cyclopentane.



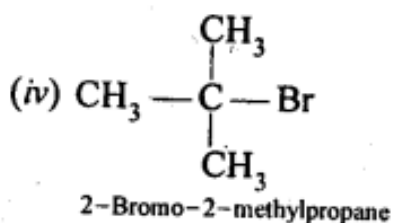
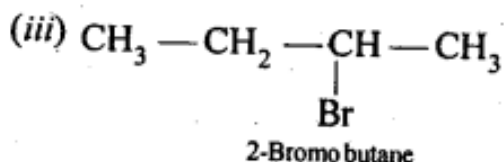
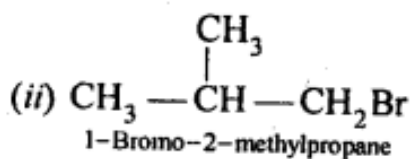
10.6. Write the isomers of the compound having formula  $C_4H_9Br$ .

Ans:

**Double bond equivalent (DBE) for  $C_4H_9Br$**

$$= \frac{4(4-2) + 9(1-2) + 1(1-2)}{2} + 1 = 0$$

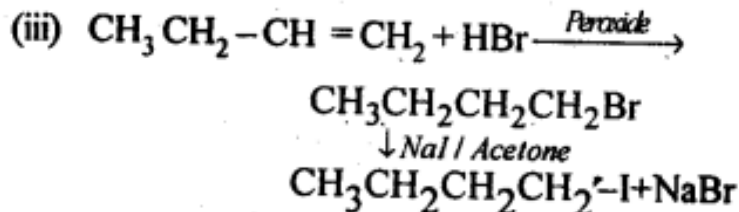
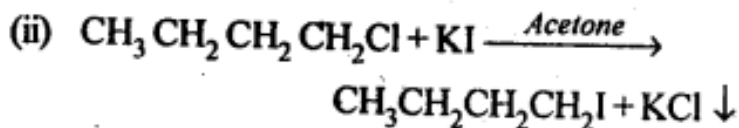
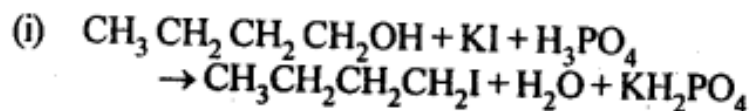
So none of the isomer has a ring or unsaturation, so the isomers are position or chain isomers



10.7. Write the equations for the preparation of 1-iodobutane from

(i) 1-butanol (ii) 1-chlorobutane (iii) but-1-ene.

Ans:



10.8. What are ambident nucleophiles? Explain with an example.

Ans: Nucleophiles which can attack through two different sites are called ambident nucleophiles. For example, cyanide ion is a resonance hybrid of the following two structures:

It can attack through carbon to form cyanide and through N to form isocyanide.

10.9. Which compound in each of the following-pairs will react faster in  $\text{S}_\text{N}2$  reaction with  $\text{OH}^-$ ?

(i)  $\text{CH}_3\text{Br}$  or  $\text{CH}_3\text{I}$

(ii)  $(\text{CH}_3)_3\text{CCl}$  or  $\text{CH}_3\text{Cl}$

Ans:

(i) Since  $\text{I}^-$  ion is a better leaving group than  $\text{Br}^-$  ion, therefore,  $\text{CH}_3\text{I}$  reacts faster  $\text{CH}_3\text{Br}$  in  $\text{S}_\text{N}2$  reaction with  $\text{OH}^-$  ion.

(ii) On steric grounds,  $1^\circ$  alkyl halides are more reactive than  $\text{tert}$ -alkyl halides in  $\text{S}_\text{N}2$  reactions. Therefore,  $\text{CH}_3\text{Cl}$  will react at a faster rate than  $(\text{CH}_3)_3\text{CCl}$  in a  $\text{S}_\text{N}2$  reaction with  $\text{OH}^-$  ion.

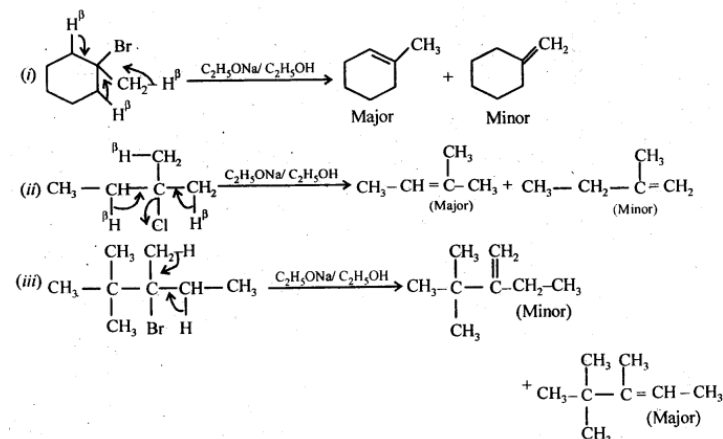
10.10. Predict all the alkenes that would be formed by dehydrohalogenation of the following halides with sodium ethoxide in ethanol and identify the major alkene:

(i) 1-Bromo-1-methylcyclohexane

(ii) 2-Chloro-2-methylbutane.

(iii) 2,2,3-Trimethyl-3-bromopentane.

Ans:



\*\*\*\*\* END \*\*\*\*\*