CHEMISTRY

NCERT - NCERT CHEMISTRY(ENGLISH)

HALOALKANES AND HALOARENES

Solved Examples

1. Draw the structures of all the eight structural isomers that have the molecular formula C_5H_{11} Br. Name each isomer according to IUPAC system and classify them as primary, secondary or tertiary bromide.

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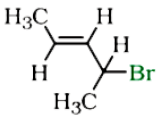
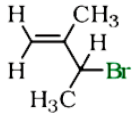
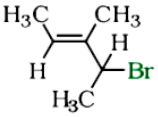
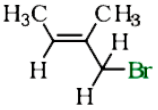
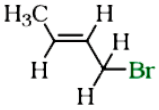
2. Write IUPAC names of the following:

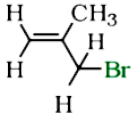
(i) 

(ii) 

(iii) 

(iv) 

(v) 

(vi) 

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3. Identify all the possible monochloro structural isomers expected to be formed on free radical monochlorination of $(CH_3)_2CHCH_2CH_3$.

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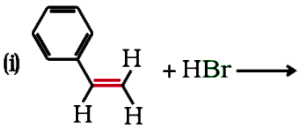
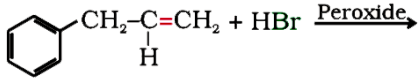
4. Write the products of the following reactions:

(i) 

(ii) $CH_3–CH_2–CH=CH_2 + HCl \longrightarrow$

(iii) 

(i)

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

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

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

(i) The four isomeric bromobutanes

(ii)

$C_6H_5CH_2Br, C_6H_5CH(C_6H_5)Br, C_6H_5CH(CH_3)Br, C_6H_5C(CH_3)(C_6H$

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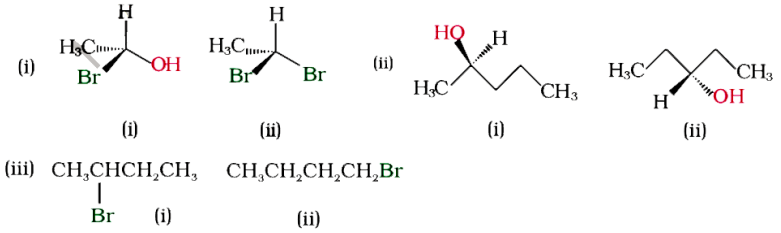
8. Identify chiral and achiral molecules in each of the following pair of compounds. (Wedge and Dash representations according to Class XI, Fig.



12.1). ltbgt

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9. Although chlorine is an electron withdrawing group, yet it is ortho-, para- directing in electrophilic aromatic substitution reactions. Why?

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Exercise

1. Write structures of the following compounds:

(i) 2-Chloro-3-methylpentane

(ii) 1-Chloro-4-ethylcyclohexane

(iii) 4-tert. Butyl-3-iodoheptane

(iv) 1,4-Dibromobut-2-ene

(v) 1-Bromo-4-sec. butyl-2-methylbenzene.

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2. Why is sulphuric acid not used during the reaction of alcohols with KI?

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3. Write structures of different dihalogen derivatives of propane.

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4. Among the isomeric alkanes of molecular formula C_5H_{12}, identify the one that on photochemical chlorination yields

(i) A single monochloride.

(ii) Three isomeric monochlorides.

(iii) Four isomeric monochlorides.

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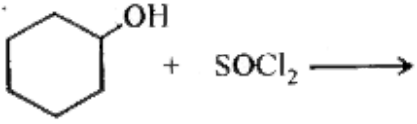
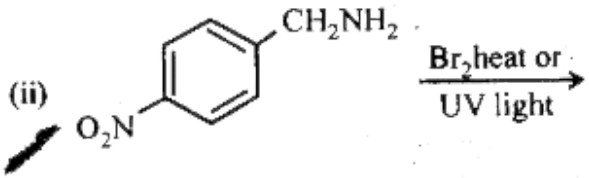
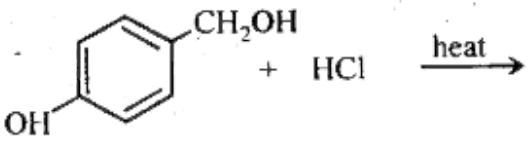
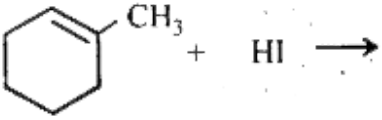
5. Draw the structures of major monohalo products in each of the following reactions:

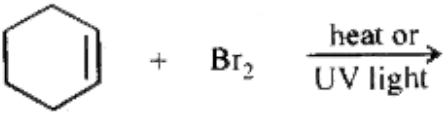
(i) 

(ii) 

(iii) 

(iv) 

(v) $CH_3CH_2Br + NaI \longrightarrow$

(vi) 

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6. Arrange each set of compounds in order of increasing boiling points.

(i) Bromomethane, Bromoform, Chloromethane, Dibromomethane.

(ii) 1-Chloropropane, Isopropyl chloride, 1-Chlorobutane.

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7. Which alkyl halide from the following pairs would you expect to react more rapidly by an SN2 mechanism? Explain your answer.

$(i) CH_3CH_2CH_2CH_2Br$ or $CH_3CH_2\underset{\underset{Br}{|}}{C}HCH_3$, $(ii) CH_3CH_2\underset{\underset{Br}{|}}{C}HCH_3$ or

(iii) $CH_3\underset{\underset{CH_3}{|}}{C}HCH_2CH_2Br$ or $CH_3CH_2\underset{\underset{CH_3}{|}}{C}HCH_2Br$

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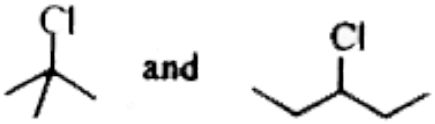
8. In the following pairs of halogen compounds, which compound undergoes faster S_N1 reaction?

(i)  and

(ii) 

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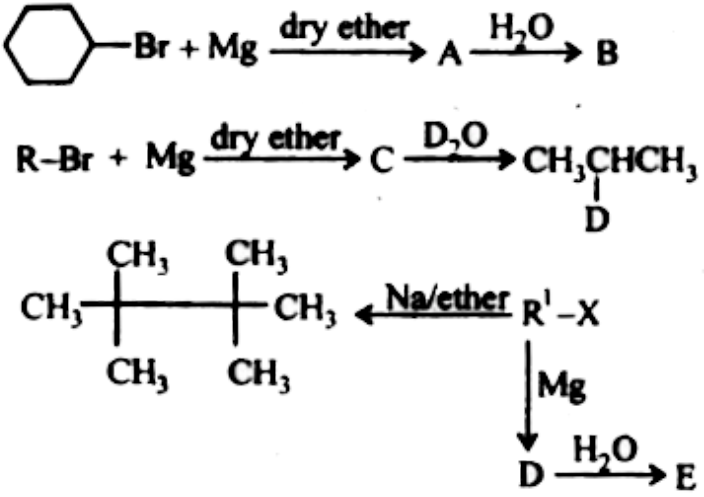
9. Identify A, B, C, D, E, R and R^1 in the following:



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

(i) $(CH_3)_2CHCH(Cl)CH_3$, $(ii)CH_3CH_2CH(CH_3)CH(C_2H_5)Cl$

(iii) $CH_3CH_2C(CH_3)_2CH_2I$, $(iv)(CH_3)_3CCH_2CH(Br)C_6H_5$

(v) $CH_3CH(CH_3)CH(Br)CH_3$, $(vi)CH_3C(C_2H_5)_2CH_2Br$

$(vii)CH_3C(Cl)(C_2H_5)CH_2CH_3$, $(viii)CH_3CH=C(Cl)CH_2CH(CH_3)_2$

(ix) $CH_3CH=CHC(Br)(CH_3)_2(x)p-ClC_6H_4CH_2CH(CH_3)_2$

(xi)

$m-ClCH_2C_6H_4CH_2C(CH_3)_3$, (xii)$o-Br-C_6H_4CH(CH_3)CH_2CH_3$

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11. Give the IUPAC names of the following compounds:

(i)

$CH_3CH(Cl)CH(Br)CH_3(ii)CHF_2CBrClF(iii)ClCH_2C\equiv CCH_2Br$

$(iv)(CCl_3)_3CCl(v)CH_3C(p-ClC_6H_4)_2CH(Br)CH_3(vi)(CH_3)_3CCH=$

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12. 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

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

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

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14. 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.

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15. Write the isomers of the compound having formula C_4H_9Br.

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

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

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

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18. Which compound in each of the following pairs will react faster in S_N2 reaction with $.^{-}OH$?

(i) CH_3Br or CH_3I, $(ii)(CH_3)_3CCl$ or CH_3Cl

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19. 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

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20. 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.

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21. Explain why

(i) the dipole moment of chlorobenzene is lower than that of cyclohexyl chloride?

(ii) alkyl halides, though polar, are immiscible with water?

(iii) Grignard reagents should be prepared under anhydrous conditions?

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

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23. Write the main product (s) in each of the following reaction :

(i) $CH_3 - \underset{CH_3}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}} - O - CH_3 + HI \rightarrow$

(ii) $CH_3 - CH = CH_2 \xrightarrow[(ii)\,3H_2O_2/OH^-]{(i)\,B_2H_6}$

(iii) $C_6H_5 - OH \xrightarrow[(ii)\,CO_2, H^+]{(i)\,aq.NaOH}$

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24. Write the mechanism of the following reaction:

nBuBr + KCN $\xrightarrow{EtOH - H_2O}$ nBuCN

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25. Rearrange the compounds of each of the following sets in order of reactivity towards $S_{N_3^2}$ displacement :

(i) 2- Bromo-2-methylbutane,

1-Bromopentane, 2- Bromopentaure.

(ii) 1- Bromo-3-methylbutance, 2-Bromo-2-methylbutance,3-Bromo-2-methybutane.

(iii) 1- Bromobutane, 1- Bromo-2,

2-dimethylbutane

1-Bromo -2- methylbutane.

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

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27. p-Dichlorobenzene has higher m.p. than those of o- and m-isomers. Discuss

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28. 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

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29. 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.

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30. Primary alkyl halide C_4H_9Br :

(a) reacted with alcoholic KOH to give compound (b) is reacted with HBr to give : (c) which is an isomer of (a). When (a) is reacted with Na metal, it

gives a compound (d), C_8H_{18} hich is different from the compound formed when n-butyl bromide is reacted with Na metal. Give the structural formula of (a) and write the equations for all the reactions.

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31. What happens when

(i) n-butyl chloride is treated with alcoholic KOH,

(ii) bromobenzene is treated with Mg in the presence of dry ether,

(iii) chlorobenzene is subjected to hydrolysis,

(iv) ethyl chloride is treated with aqueous KOH,

(v) methyl bromide is treated with sodium in the presence of dry ether,

(vi) methyl chloride is treated with KCN?

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