CBSE Test Paper-04

Class - 12 Chemistry (Haloalkanes and Haloarenes)

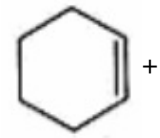
1. Maximum number of molecules of CH_3I that can react with a molecule of CH_3NH_2 is
   a. 2
   b. 4
   c. 1
   d. 3
2. When a haloalkane with β – hydrogen atom is heated with alcoholic solution of potassium hydroxide,
   a. All of these
   b. elimination of halogen atom from α – carbon
   c. elimination of hydrogen atom from β– carbon
   d. alkene is formed as a product
3. The compound formed on heating chlorobenzene with nitric acid in the presence of concentrated sulphuric acid is:
   a. DDT
   b. Gammexene
   c. Freon
   d. Hexachloroethane
4. Finkelstein reaction is
   a. $CH_3CH_2CH_2Cl + NaI \rightarrow CH_3CH_2CH_2I + NaCl$
   b. $CH_3CH_2CH_2Cl + NaBr \rightarrow CH_3CH_2CH_2Br + NaCl$
   c. $CH_3CH_2CH_2I + NaCl \rightarrow CH_3CH_2CH_2 - Cl + NaI$
   d. $CH_3 = CH_2 + H - I \rightarrow CH_3CH_2CH_2I + CH_3CHICH_3$
5. Methyl bromide is converted into ethane by heating it in ether medium with
   a. Na
   b. Al
   c. Cu
   d. Zn
6. What are diastereomers?

7. Give the IUPAC name of $C_6H_5CH_2CH_2Cl$.

8. What is meant by chiral or asymmetric carbon atom?

9. Differentiate between geminal and vicinal halides.

10. Draw the structure of the major monohalo product in the following reaction:



$$\text{+ } Br_2 \xrightarrow[\text{uv light}]{\text{heat}}$$

11. How will you bring the following conversion?
    1-Chlorobutane to n-octane

12. What happens when:
    i. Propene is treated with HBr in presence of peroxide?
    ii. Benzene is treated with methyl chloride in presence of $AlCl_3$?

13. Which compound in each of the following pairs will react faster in S_N2 reaction with OH^-?
    i. CH_3Br or CH_3I
    ii. $(CH_3)_3$ CCl or CH_3Cl

14. Propose the mechanism of the following reaction:
    $CH_3CH_2Br + CH_3O^- \rightarrow CH_3CH_2OCH_3 + Br^-$

15. i. $CH_3CH_2OH \xrightarrow{SOCl_2} 'A' \xrightarrow{KCN} 'B'$
    ii. $CH_3 - \underset{\underset{OH}{|}}{CH} - CH_3 \xrightarrow{PCl_5} 'A' \xrightarrow{AgCN} 'B'$
    iii. $CH_3CH_2Cl \xrightarrow{AgNO_2} 'A'$
    iv. $(CH_3)_2CHCl + CH \equiv CNa \rightarrow 'A'$
    v. $CH_3CH_2CH_2Cl + CH_3COOAg \rightarrow 'A' + 'B'$
    vi. $2(CH_3)_2CHBr + 2Na \xrightarrow[ether]{Dry}$

CBSE Test Paper-04

Class - 12 Chemistry (Haloalkanes and Haloarenes)

Solutions

1. (d) 3

   Explanation: CH_3NH_2 can act as nucleophile to cause substitution reaction. $(CH_3)_4N^+$ this is formed when 3 moles of CH_3NH_2 reacts with methyl halide.

2. (a) All of these

   Explanation: When a haloalkane with β-hydrogen atom is heated with alcoholic solution of potassium hydroxide, there is elimination of hydrogen atom from β-carbon and a halogen atom from the α-carbon atom. As a result, an alkene is formed as a product. Since β-hydrogen atom is involved in elimination, it is often called β-elimination.

3. (a) DDT

   Explanation: Dichloro diphenyl trichloroethane (DDT) Non-water soluble chlorinated hydrocarbon in use since Second World War (1939-1945) as an insecticide for the control of lice (that spread typhus) and mosquitoes (that spread malaria and yellow fever

4. (a) $CH_3CH_2CH_2Cl + NaI \rightarrow CH_3CH_2CH_2I + NaCl$

   Explanation: Halide exchange reaction is Finkelstein reaction in which alkyl chloride is converted to alkyl iodide.
   The classic Finkelstein reaction entails the conversion of an alkyl chloride or an alkyl bromide to an alkyl iodide by treatment with a solution of sodium iodide in dry acetone. Sodium iodide is soluble in acetone and sodium chloride and sodium bromide are not. The reaction is driven toward products according to Le chatelier's principle due to the precipitation of the salt insoluble in acetone. For example, in this case chloropropane can be converted to iodopropane:
   $CH_3CH_2CH_2Cl_{(acetone)} + NaI_{(acetone)} \rightarrow CH_3CH_2CH_2I_{(acetone)} + NaCl_{(s)}$

5. (a) Na

   Explanation: $2CH_3Br + 2Na \rightarrow CH_3CH_3 + 2NaBr$

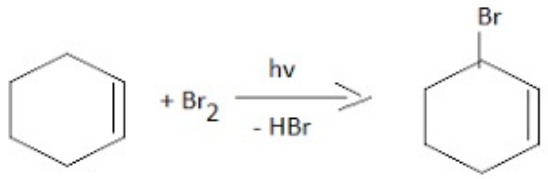
6. Diastereomers are those optical isomers which are non-superimposable but not

mirror images of each other.

7. 1-chloro-2-phenylethane

8. A chiral or asymmetric carbon atom is a carbon atom which is attached to four different groups.

9. The dihalo-compounds having same type of halogen atoms are classified as geminal halides (halogen atoms are present on the same carbon atom) and vicinal halides (halogen atoms are present on the adjacent carbon atoms).

10. 

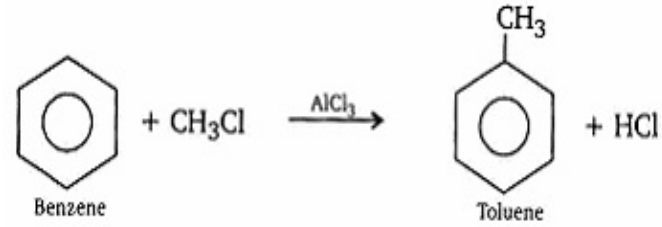
11. $$\underset{1-\text{chlorobutane}}{2CH_3CH_2CH_2CH_2-Cl} + 2Na \xrightarrow[-2NaCl]{dry\ ether} \underset{n-\text{Octane}}{CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_3}$$

    By treating 1-chlorobutane with sodium in presence of dry ether, we can get n-octane

12. i. Anti-markownikoff reaction:

    $$\underset{\text{Propene}}{CH_3CH=CH_2} + HBr \xrightarrow{Peroxide} \underset{1-Bromoprepane}{CH_3CH_2CH_2Br}$$

    ii. Friedel-craft alkylation:

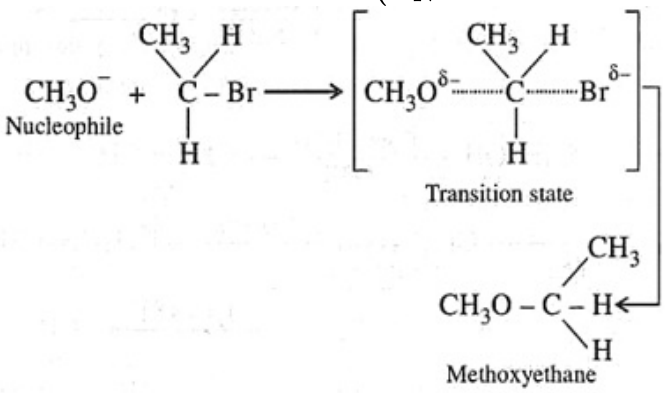
13. i. Since I^- ion is a better leaving group than Br^- ion, therefore, CH_3I will react faster than CH_3Br in S_N2 reaction with OH^-ion.

    ii. On steric grounds 1° alkyl halides are more reactive than tert-alkyl halide in S_N2 reactions. Since this reaction requires the approach of the nucleophile to the carbon bearing the leaving group, the presence of bulky substituents on or near

the carbon atom have a dramatic inhibiting effect. Therefore, CH_3Cl will react at a faster rate than $(CH_3)_3\ CCl$ in a S_N2 reaction with OH^-ion.

14. $CH_3CH_2Br + CH_3O^- \rightarrow CH_3CH_2OCH_3 + Br^-$

$Mechanism (S_N2\ mechanism)$



15. i. $CH_3CH_2OH \xrightarrow{SOCl_2} \underset{'A'}{CH_3CH_2Cl} \xrightarrow{KCN} \underset{'B'}{CH_3CH_2CN}$

Chloroethane

Propane nitrile (cyanopropane)

ii. $CH_3 - \underset{OH}{CH} - CH_3 \xrightarrow{PCl_5} CH_3 - \underset{\substack{Cl \\ 'A'}}{CH} - CH_3 \xrightarrow{AgCN} CH_3 - \underset{\substack{N \overset{\rightarrow}{=} C \\ 'B'}}{CH} - CH_3$

2-chloropropane

Propyl isocyanide

iii. $CH_3CH_2Cl \xrightarrow{AgNO_2} \underset{'A'}{CH_3CH_2NO_2} + AgCl$

Nitroethane

iv. $(CH_3)_2CHCl + HC \equiv CNa \rightarrow (CH_3)_2CH - C \equiv CH + NaCl$

3 - mythylbut - 1 - yne

v. $CH_3CH_2CH_2Cl + CH_3COOAg \rightarrow \underset{'A'}{CH_3COOCH_2CH_2CH_3} + \underset{'B'}{AgCl}$

Propyl ethanoate

Silver chloride

vi. $2(CH_3)_2CHBr + 2Na \xrightarrow[ether]{Dry} CH_3 - \underset{CH_3}{CH} - \underset{CH_3}{CH} - CH_3 + 2NaBr$

2, 3 - Dimethylbutane