COMPLETE the REACTIONS

Q13 Draw the structures of major monohalo products in each of the following reactions:

Answer

OH + SOCI₂
$$\longrightarrow$$
 CI + SO₂ + HC

Cyclohexanol Chlorocyclohexane

$$O_{2N} \xrightarrow{\text{CH}_{2}\text{CH}_{3}} \xrightarrow{\text{Dest or } \text{UV light}} O_{2N} \xrightarrow{\text{CH}_{2}\text{CH}_{3}} + \text{HBr}$$

(ii) 4 - Ethylnitrobenzene $4 - (1 - \text{Bromoethyl}) \text{ nitrobenzene}$

Q14 Identify A, B, C, D, E, R and R¹ in the following:

Br + Mg dry ether A
$$H_2O$$
 B

$$R - Br + Mg dry ether C D_2O CH_3CHCH_3$$

$$CH_3 CH_3 CH_3 D$$

$$CH_3 CH_3 CH_3 R^1 - X Mg D H_2O E$$

Bromocydohexane Cyclohexylmagnesium Cyclohexane bromide (A)
$$H_2O \longrightarrow H_2O \longrightarrow H_3O \longrightarrow H_3$$

Since D of D₂O gets attached to the carbon atom to which MgBr is attached, C is

Therefore, the compound R - Br is

When an alkyl halide is treated with Na in the presence of ether, a hydrocarbon containing double the number of carbon atoms as present in the original halide is obtained as product. This is

known as Wurtz reaction. Therefore, the halide, R¹–X, is Therefore, compound D iscompound E is

$$CH_3$$
 And,
 CH_3 — C — X
 CH_3
 CH_3
 CH_3

Q15 Write structures of the products of the following reactions:

(i)
$$CH_3 - CH = CH_2 \xrightarrow{H_2O/H^+}$$

O $CH_2 - C - OCH_3 \xrightarrow{NaBH_4}$

(ii) $CH_3 - CH_2 - CH - CHO \xrightarrow{NaBH_4}$

(iii)

$$CH_3 - CH = CH_2 \xrightarrow{H_2O/H^+} CH_3 - CH - CH_3$$
Propene
Propene OH
Propene-2-ol

$$\begin{array}{c} \text{CH}_3-\text{CH}_2-\text{CH}-\text{CHO} \xrightarrow{\text{NaBH}_4} \text{CH}_3-\text{CH}_2-\text{CH}-\text{CH}_2\text{OH} \\ \text{CH}_3 & \text{CH}_3 \\ \end{array}$$

$$\begin{array}{c} \text{CH}_3 & \text{CH}_3 \\ \text{CH}_3 & \text{CH}_3 \\ \end{array}$$

$$\begin{array}{c} \text{CH}_3 & \text{CH}_3 \\ \text{CH}_3 & \text{CH}_3 \\ \end{array}$$

$$\begin{array}{c} \text{CH}_3 & \text{CH}_3 \\ \text{CH}_3 & \text{CH}_3 \\ \text{CH}_3 & \text{CH}_3 \\ \end{array}$$

Q16 Write the products of the following reactions:

(i)
$$H + HBr \longrightarrow$$
 (ii) $CH_3-CH_2-CH=CH_2+HCl \longrightarrow$
(iii) $CH_2-C=CH_2+HBr \xrightarrow{Peroxide}$

Answer

(i)
$$H$$
 (ii) $CH_3-CH_2-CH-CH_3$ (iii) $CH_2-CH_2-CH_2-CH_2-CH_3$ CH2-CH2-CH2-CH3

Q17 Predict the products of the following reactions:

(i)
$$CH_3 - CH_2 - CH_2 - O - CH_3 + HBr \rightarrow$$

(ii)
$$OC_2H_5$$
 + HBr OC_2H_5 Conc.H₂O₄ Conc.H_NO₃

(iv)
$$(CH_3)_3 C - OC_2H_5 \xrightarrow{HI}$$

$$CH_3-CH_2-CH_2-O-CH_3 + HBr \longrightarrow \\ \textit{n-propylmethyl ether} \qquad CH_3-CH_2-CH_2-OH+CH_3-Br$$
 (i) Propanol Bromomethane

$$OC_2H_5$$

+ HBr OH
+ C_2H_5Br
(ii) Ethoxybenzene Phenol Bromoethane

$$(CH_3)_3 C - OC_2H_5 \xrightarrow{HI} (CH_3)_3 C - I + C_2H_5OH$$

(iv) tert-Butyl ethyl ether tert-Butyliodide Ethanol

- Q18 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.

Answer

(i) Br
$$CH_3$$
 Br CH_3 CH_3

1-bromo-1-methylcyclohexane

In the given compound, all β -hydrogen atoms are equivalent. Thus, dehydrohalogenation of this compound gives only one alkene.

(ii)
$$\begin{array}{c}
CI \\
CH_3 - C - CH_2 \\
CH_3
\\
CH_3
\\
CH_3
\end{array}$$

(iii) In the given compound, there are two different sets of equivalent β -hydrogen atoms labelled as a and b. Thus, dehydrohalogenation of the compound yields two alkenes.

$$CH_{3} - C - CH_{2} - CH_{3} \xrightarrow{C_{2}H_{5}ONa/C_{2}H_{5}OH} CH_{3} - C = CH - CH_{3}$$

$$CH_{3} - C - CH_{2} - CH_{3} \xrightarrow{C_{2}H_{5}ONa/C_{2}H_{5}OH} CH_{3} - C = CH - CH_{3}$$

$$CH_{3} -$$

Saytzeff's rule implies that in dehydrohalogenation reactions, the alkene having a greater number of alkyl groups attached to a doubly bonded carbon atoms is preferably produced. Therefore, alkene (I) i.e., 2-methylbut-2-ene is the major product in this reaction.

(iii)

$$\begin{array}{c|c} CH_3 & Br \\ \hline \\ CH_3 & C & C \\ \hline \\ CH_3 & CH_2 \\ \hline \\ CH_3 & CH_3 \\ \hline \\ CH_3 & CH_3 \\ \hline \\ \end{array} \qquad \qquad 2,2,3-Trimethyl-3-bromopentane$$

In the given compound, there are two different sets of equivalent β -hydrogen atoms labelled as a and b. Thus, dehydrohalogenation of the compound yields two alkenes.

According to Saytzeff's rule, in dehydrohalogenation reactions, the alkene having a greater number of alkyl groups attached to the doubly bonded carbon atom is preferably formed.

Q19 Write the structures of products of the following reactions;

$$+ C_2H_5 \stackrel{O}{\subset}_{Cl} \xrightarrow{Anhyd. AlCl_3}$$

(iii)
$$H_3C - C \equiv C - H$$
 $\xrightarrow{Hg^{2^+}, H_2SO_4}$ CH_3 CrO_2Cl_2 $OTA = 1. CrO_2Cl_2$ $OTA = 1. CrO_2Cl_2$ $OTA = 1. CrO_2Cl_2$ $OTA = 1. CrO_2Cl_2$ $OTA = 1. CrO_2Cl_2$

Answer

$$(C_6H_5CH_{2)2}Cd + 2 CH_3COCI \longrightarrow 2 CH_2 - C - CH_3 + CdCl_2$$

$$1 - Phenylpropanone$$

$$\begin{array}{c} H_3C-C \equiv C-H+H-OH & \xrightarrow{Hg^{2+}, \text{ did. } H_2SO_4} & \begin{bmatrix} OH \\ H_3C-C = CH_2 \end{bmatrix} \\ O \\ H_3C-C-CH_3 \\ \hline \\ Propanone \\ \end{array}$$

$$\begin{array}{c} \text{CH}_3 \\ \text{NO}_2 \\ p-\text{Nitrotohuene} \end{array} \qquad \begin{array}{c} \text{I. CrO}_2\text{Cl}_2 \\ \text{O}_2\text{N}-\text{O}_2\text{CH}_2\text{OH} \\ \text{O}_2\text{CrCl}_2\text{OH} \\ \text{O}_2\text{N}-\text{CHO}_2\text{CHO}_2\text{OH} \\ \text{O}_2\text{N}-\text{CHO}_2\text$$

Q20 Predict the products of the following reactions:

(ii)
$$+ HO - NH_2 \xrightarrow{H^+}$$

(iii) $R - CH = CH - CHO + NH_2 - C - NH - NH_2 \xrightarrow{H^+}$

(iii) $R - CH = CH - CHO + NH_2 - C - NH - NH_2 \xrightarrow{H^+}$

(i)
$$HO - NH_2$$
 H^+ $N - OH$ O_2N O_2N NNH NNH NNH NNH NNH NNH NNH

(iii)
$$R - CH = CH - CHO + NH_2 - C - NH - NH_2 - H^+$$

$$R - CH = CH - CH = N - NH - C - NH_2$$

(iv)
$$C_{CH_3}$$
 C_{CH_3} $C_{CH_3CH_2NH_2}$ $C_{CH_3CH_2NH_2}$

Q 21Give the structures of A, B and C in the following reactions:

(i)
$$CH_3CH_2I \xrightarrow{NaCN} A \xrightarrow{OH^-} B \xrightarrow{NaOH_+Br_2} C$$

$$C_6H_5N_2CI \xrightarrow{CuCN} A \xrightarrow{H_2O/H^+} B \xrightarrow{NH_3} C$$
 (ii)

(iii)
$$CH_3CH_2Br \xrightarrow{KCN} A \xrightarrow{LiAIH_4} B \xrightarrow{HNO_2} C$$

(iv)
$$C_6H_5NO_2 \xrightarrow{Fe/HCI} A \xrightarrow{NaNO_2+HCI} B \xrightarrow{H_2O/H^+} C$$

(v)
$$CH_3COOH \xrightarrow{NH_3} A \xrightarrow{NaOBr} B \xrightarrow{NaNO_2/HCI} C$$

(vi)
$$C_6H_5NO_2 \xrightarrow{Fe/HCI} A \xrightarrow{HNO_2} B \xrightarrow{C_6H_5OH} C$$

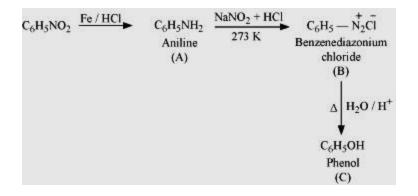
(i)

(ii)

$$\begin{array}{c|c} C_6H_5N_2CI & \xrightarrow{CuCN} & C_6H_5CN \\ \hline & Cyanobenzene \\ & (A) & & & \\ \hline & & & \\$$

(iii)

<u>Answer</u>



(v)

(vi)

$$C_6H_5NO_2 \xrightarrow{Fe/HCl} C_6H_5NH_2 \xrightarrow{Aniline} (A) \xrightarrow{HNO_2} C_6H_5 - N_2Cl$$

Benzenediazonium chloride (B)

$$C_6H_5OH \longrightarrow N = N \longrightarrow OH$$
 $p - \text{Hydroxyazobenzene}$ (C)

Q22 Complete the following reactions:

(i)
$$C_6H_5NH_2 + CHCI_3 + alc.KOH \rightarrow$$

(ii)
$${}^{C_6H_5N_2Cl + H_3PO_2 + H_2O} \rightarrow$$

(iii)
$$C_6H_5NH_2 + H_2SO_4(conc.) \rightarrow$$

(iv)
$$C_6H_5N_2Cl+C_2H_5OH \rightarrow$$

(v)
$$C_6H_5NH_2 + Br_2(aq) \rightarrow$$

(vi)
$$C_6H_5NH_2 + (CH_3CO)_2O \rightarrow$$

(vii)
$$C_6H_5N_2C1 \xrightarrow{(i)HBF_4} (ii)NaNO_2/Cu,\Delta \rightarrow$$

Answer (i)

Carbylamine
$$C_6H_5NH_2 + CHCl_3 + 3alc.KOH \xrightarrow{reaction} 3H_2O + 3KCl + C_6H_5 - NC$$
Aniline

Phenyl isocyanide

(ii)

$$C_6H_5N_2Cl + H_3PO_2 + H_2O \rightarrow C_6H_6 + N_2 + H_3PO_3 + HCl$$

Benzenediazonium Benzene
chloride

(iii)

$$C_6H_5NH_2 + conc.H_2SO_4 \rightarrow C_6H_5 \stackrel{+}{N}H_3HSO_4$$

Aniline Anilinium hydrogen sulphate

(iv)

$$C_6H_5N_2Cl + C_2H_5OH \rightarrow C_6H_6 + CH_3CHO + N_2 + HCl$$

Benzenediazonium Ethanol Benzene Ethanal chloride

(v)

$$C_6H_5NH_2 + 3Br_{2 (aq)}$$

Aniline

 Br
 Br
 Br
 Br
 Br
 Br
 Br
 Br
 Br
 Br

(vi)

$$C_6H_5NH_2 + (CH_3CO)_2O$$
 \longrightarrow $C_6H_5-N-C-CH_3 + CH_3COOH$
Aniline acetic anhydride H O acetic acid

 N - Phenylethanamide

(vii)

$$\begin{array}{c} C_6H_5N_2CI \xrightarrow{(i)HBE_4 \atop (ii)NaNO_2/Cu,\Delta} C_6H_5NO_2 + N_2 + NaBF_4 \\ \\ Benzenediazonium & Nitrobenzene \\ \\ chloride \end{array}$$