CBSE Class 12 physics

Important Questions

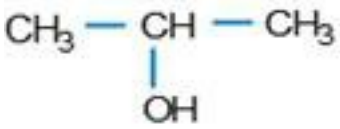
Chapter 10

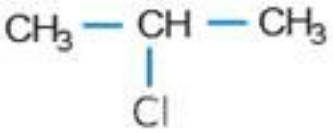
Haloalkanes and Haloarenes

3 Marks Questions

1. $CH_3CH_2CH_2Br \xrightarrow{alc\ KOH} (X) \xrightarrow{H/H_2O} (Y) \xrightarrow{PCl_5} (Z)$

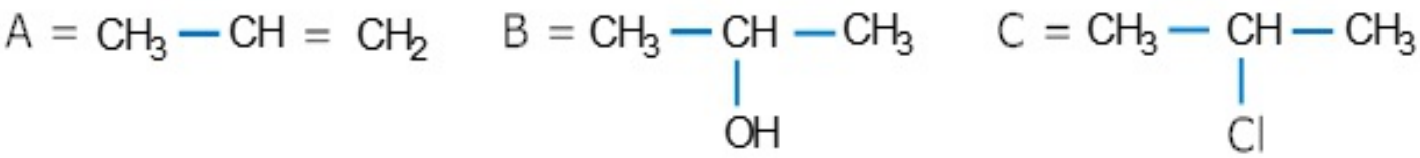
Ans. X = $CH_3CH = CH_2$

Y = 

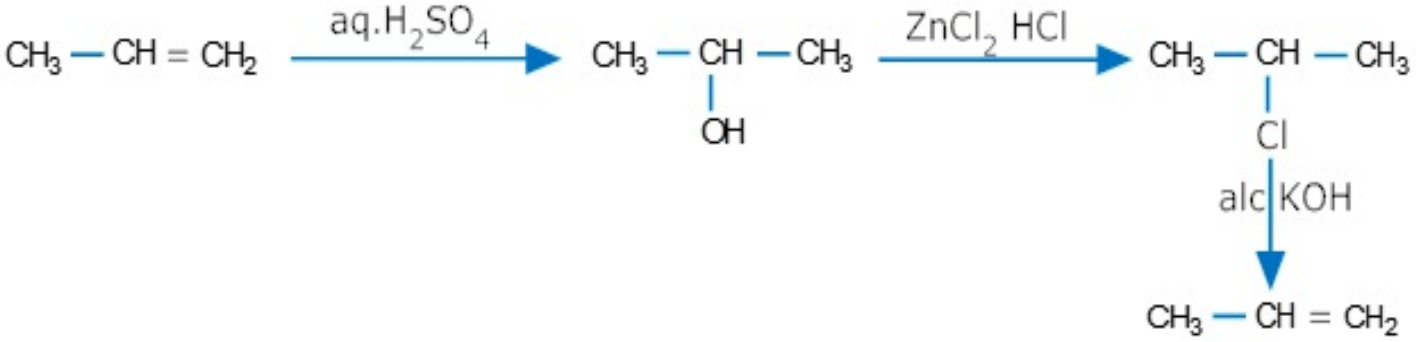
Z = 

2. An organic compound 'A' having molecular formula C_3H_6 on treatment with aqueous H_2SO_4 given' B' which on treatment with Lucas reagent gives 'C'. The compound 'C' on treatment with ethanolic KOH gives back on compound 'A'. Identify A, B, & C.

Ans.

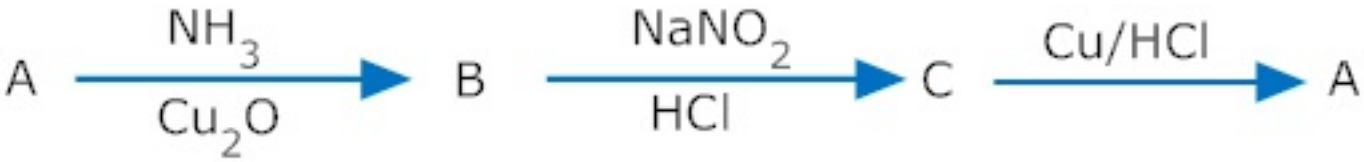


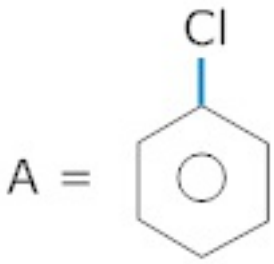
The question are

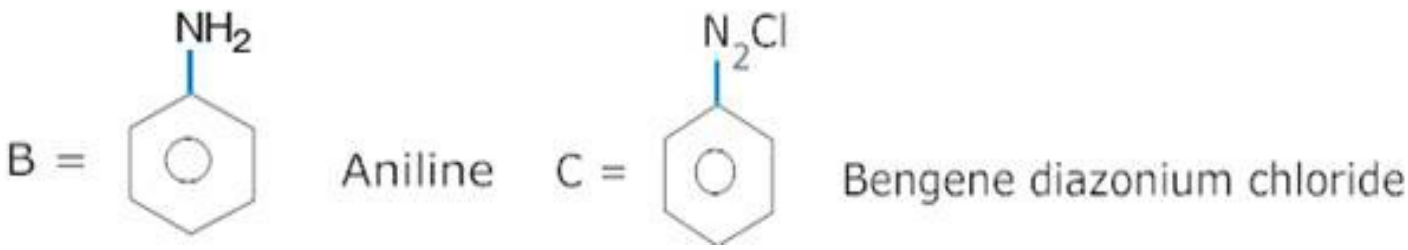


3. An organic compound 'A' on heating with NH_3 and cuprous oxide at high pressure gives compound 'B'. The compound 'B' on treatment with ice cold solution of $NaNO_2$ and HCl gives 'C" , which on heating with copper turning and HCl gives 'A' again. Identify A, B & C. compound

Ans.







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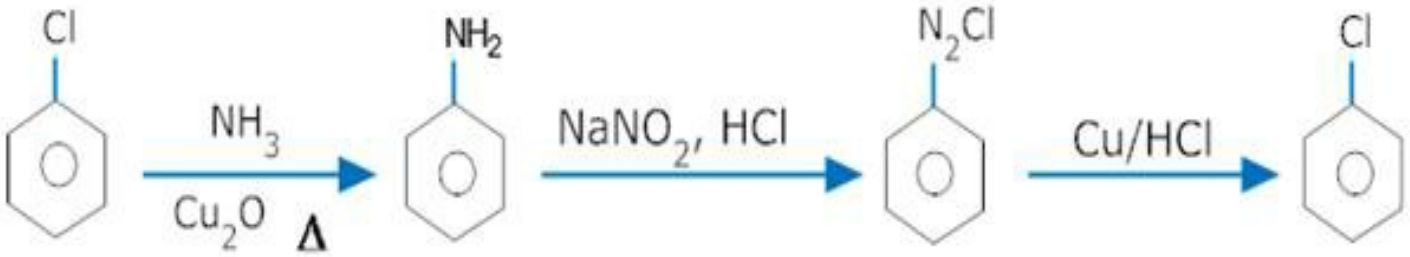

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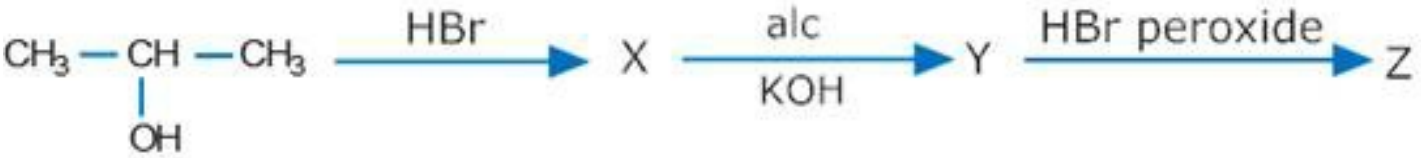
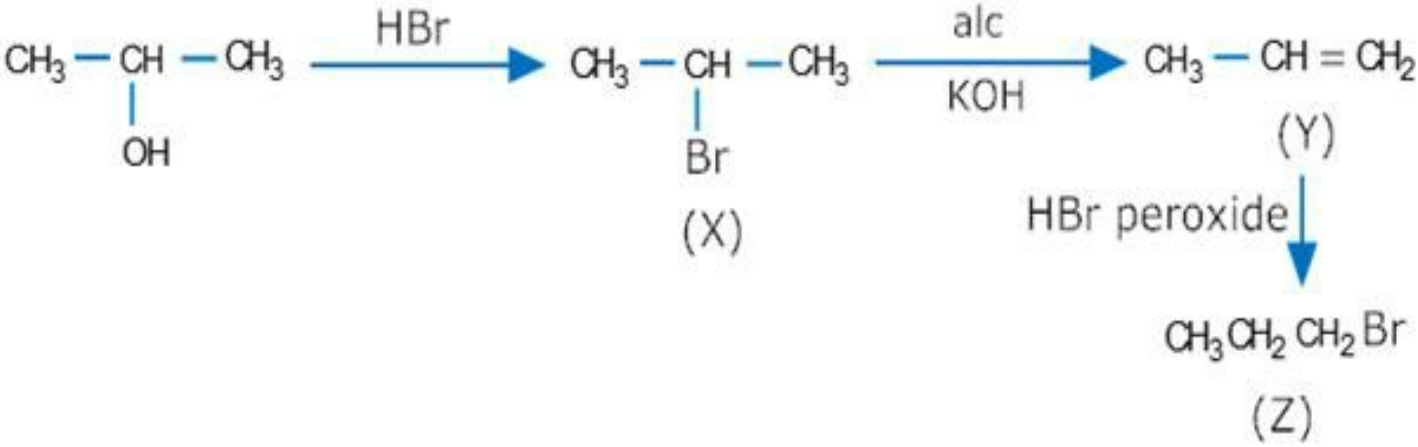
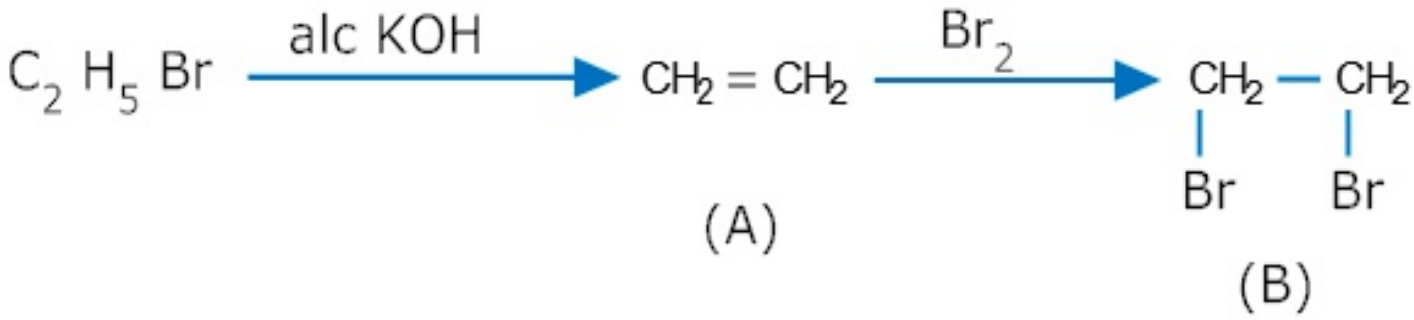


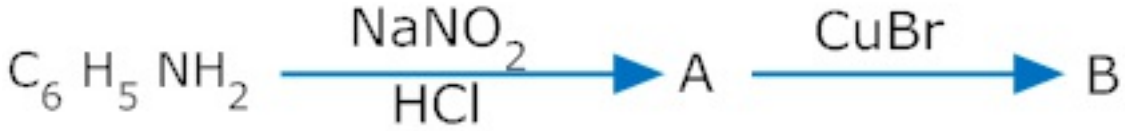
Ans.



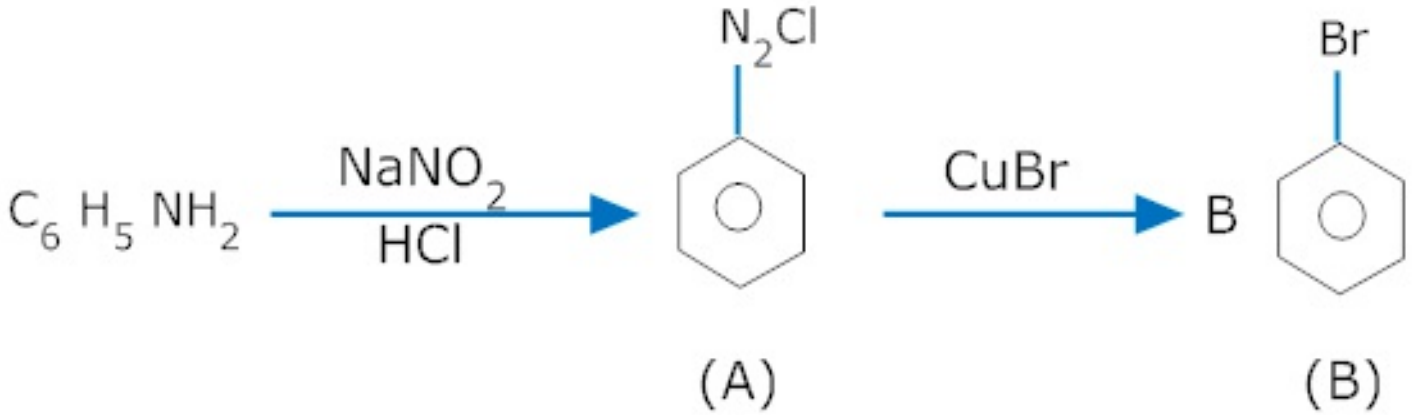
5.

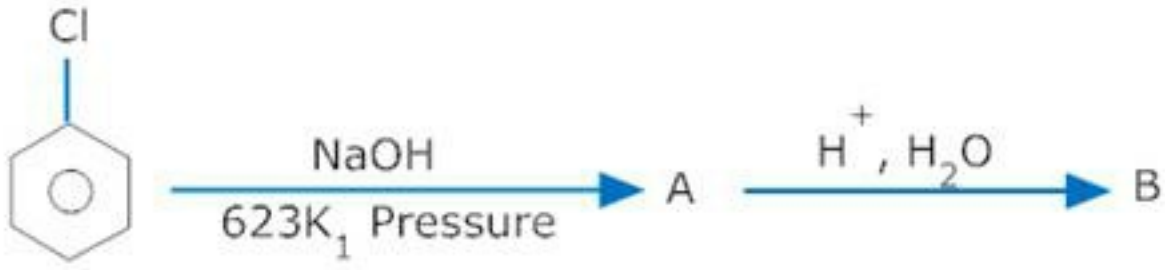
Ans.


C2 H5 Br
alc KOH
CH2 = CH2
Br2
CH2 — CH2
Br Br
(A)
(B)

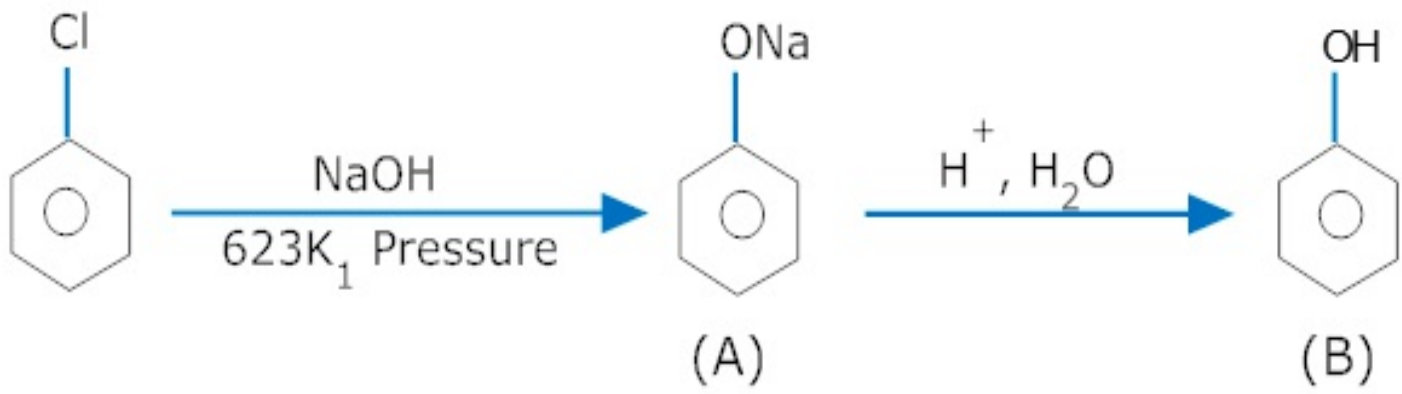
6. 
C6 H5 NH2
NaNO2
HCl
A
CuBr
B

Ans.


C6 H5 NH2
NaNO2
HCl
N2Cl
CuBr
B
Br
(A)
(B)

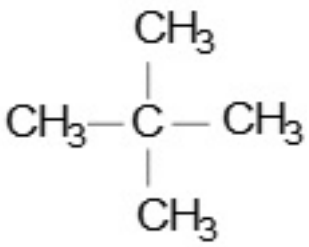
7. 
Cl
NaOH
623K1 Pressure
A
H+, H2O
B

Ans.

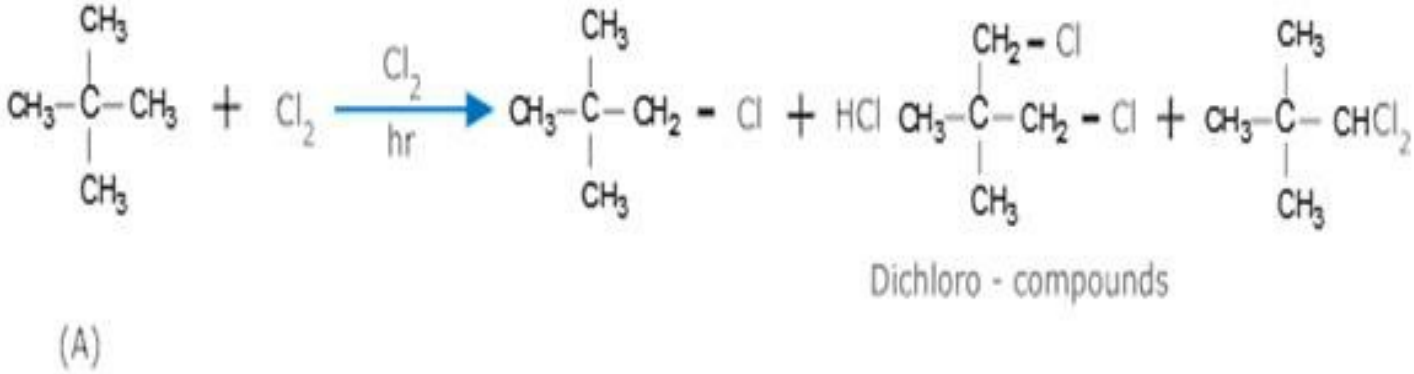


8. A compound 'A' contains carbon and hydrogen only and has molecular mass of 72. Its photo chlorination gives a mixture containing only one monochloro and two dichloro hydrocarbons. Deduce the structure of A and chlorinated products.

Ans. A is C_5H_{12} (mol. Wt. 72) Since its gives one mono chloro and two dichloro derivatives on photochemical chlorination, it is



The reactions are



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

Ans. In the presence of sulphuric acid (H_2SO_4), KI produces HI

$$2\,KI + H_2SO_4 \longrightarrow 2\,KHSO_4 + 2\,HI$$

Since H_2SO_4 is an oxidizing agent, it oxidizes HI (produced in the reaction to I_2).

$$2HI + H_2SO_4 \longrightarrow I_2 + SO_2 + H_2O$$

As a result, the reaction between alcohol and HI to produce alkyl iodide cannot occur. Therefore, sulphuric acid is not used during the reaction of alcohols with KI. Instead, a non-oxidizing acid such as H_3PO_4 is used.

10. 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.

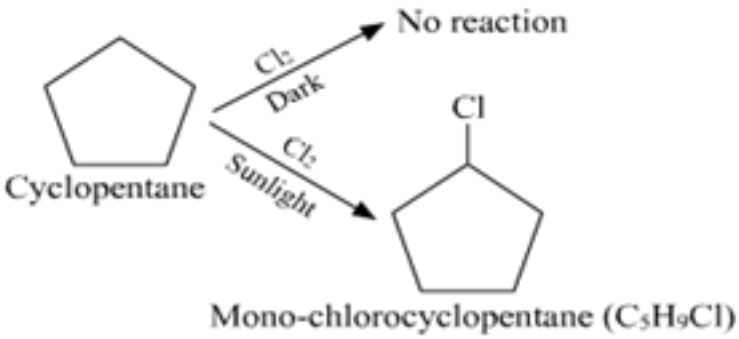
Ans. A hydrocarbon with the molecular formula, C_5H_{10} belongs to the group with a general molecular formula C_nH_{2n}. Therefore, it may either be an alkene or a cycloalkane.

Since hydrocarbon does not react with chlorine in the dark, it cannot be an alkene. Thus, it should be a cycloalkane.

Further, the hydrocarbon gives a single monochloro compound, C_5H_9Cl by reacting with chlorine in bright sunlight. Since a single monochloro compound is formed, the hydrocarbon must contain H-atoms that are all equivalent. Also, as all H-atoms of a cycloalkane are equivalent, the hydrocarbon must be a cycloalkane. Hence, the said compound is cyclopentane.

Cyclopentane (C_5H_{10})

The reactions involved in the question are:



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

(i) 1-butanol

(ii) 1-chlorobutane

(iii) but-1-ene.

Ans. (i)

$$CH_3—CH_2—CH_2—CH_2—OH + HI \xrightarrow{ZnCl_2} CH_3—CH_2—CH_2—CH_2—I + H_2O$$

1 – Butanol — 1 – Iodobutane

(ii)

$$CH_3—CH_2—CH_2—CH_2—Cl + NaI \xrightarrow[\text{(Finkelstein reaction)}]{\text{dry acetone}} NaCl + CH_3—CH_2—CH_2—CH_2—I$$

1 – Chlorobutane — 1 – Iodobutane

(iii)

$$CH_3—CH_2—CH=CH_2 + HBr \xrightarrow[\text{(Anti – Markovnikov's addition)}]{\text{Peroxide}} CH_3—CH_2—CH_2—CH_2—Br$$

$$NaBr + CH_3—CH_2—CH_2—CH_2—I \xleftarrow{NaI/\text{dry acetone}} CH_3—CH_2—CH_2—CH_2—Br$$

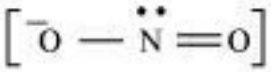
1 – Iodobutane — 1 – Bromobutane

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

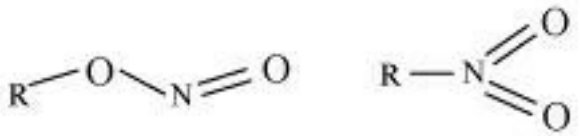
Ans. Ambident nucleophiles are nucleophiles having two nucleophilic sites. Thus, ambident

nucleophiles have two sites through which they can attack.

For example, nitrite ion is an ambident nucleophile.



Nitrite ion can attack through oxygen resulting in the formation of alkyl nitrites. Also, it can attack through nitrogen resulting in the formation of nitroalkanes.



Alkylnitrite Nitroalkane

13. Which compound in each of the following pairs will react faster in S_N^2 reaction with OH^-?

(i) CH_3Br *or* CH_3I

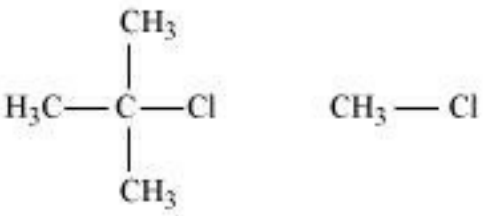
(ii) $(CH_3)_3CCl$ *or* CH_3Cl

Ans. (i) In the S_N^2 mechanism, the reactivity of halides for the same alkyl group increases in the order. This happens because as the size increases, the halide ion becomes a better leaving group.

R-F << R-Cl < R-Br < R-I

Therefore, CH_3I will react faster than CH_3Br in S_N^2 reactions with OH^-.

(ii)



The S_N^2 mechanism involves the attack of the nucleophile at the atom bearing the leaving

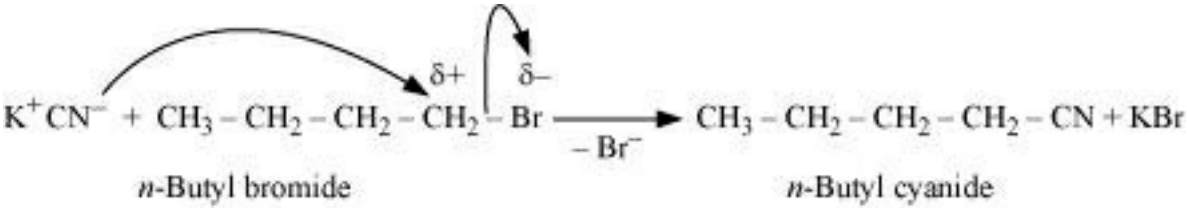
group. But, in case of $(CH_3)_3CCl$, the attack of the nucleophile at the carbon atom is hindered because of the presence of bulky substituents on that carbon atom bearing the leaving group. On the other hand, there are no bulky substituents on the carbon atom bearing the leaving group in CH_3Cl. Hence, CH_3Cl reacts faster than $(CH_3)_3CCl$ in S_N^2 reaction with OH^-.

14. Write the mechanism of the following reaction:

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

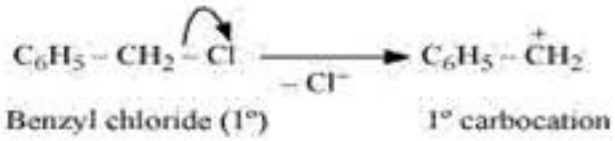
Ans. $nBuBr + KCN \xrightarrow{EtOH-H_2O} nBuCN$

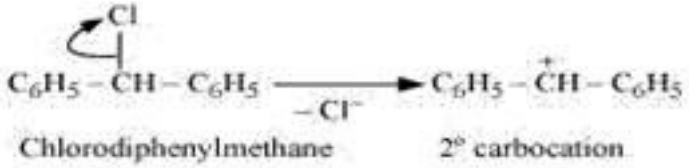
The given reaction is an S_N^2 reaction. In this reaction, CN^- acts as the nucleophile and attacks the carbon atom to which Br is attached. CN^- ion is an ambident nucleophile and can attack through both C and N. In this case, it attacks through the C-atom.



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

Ans.



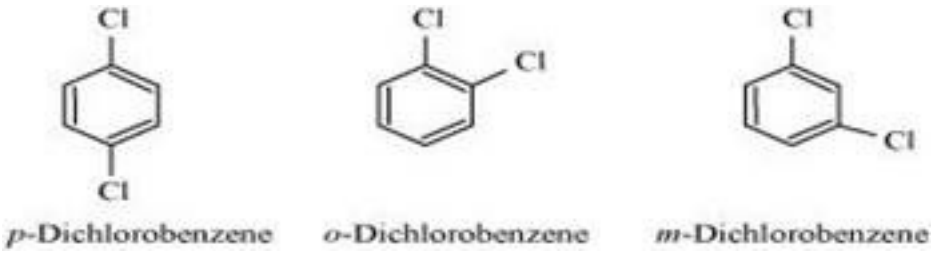


Hydrolysis by aqueous KOH proceeds through the formation of carbocation. If carbocation is stable, then the compound is easily hydrolyzed by aqueous KOH. Now $C_6H_5CH_2Cl$, forms

$1°-$ carbocation, while $C_6H_5CHClC_6H_5$ forms $2°-$ carbocation, which is more stable than $1°-$ carbocation. Hence $C_6H_5CHClC_6H_5$, is hydrolyzed more easily than $C_6H_5CH_2Cl$ by aqueous KOH.

16. *p*-Dichlorobenzene has higher m.p. and lower solubility than those of *o*- and *m*-isomers. Discuss.

Ans.



p-Dichlorobenzene is more symmetrical than *o*-and *m*-isomers. For this reason, it fits more closely than *o*-and *m*-isomers in the crystal lattice. Therefore, more energy is required to break the crystal lattice of *p*-dichlorobenzene. As a result, *p*-dichlorobenzene has a higher melting point and lower solubility than *o*-and *m*-isomers.