

# **CHEMISTRY STUDY MATERIALS FOR CLASS 12**

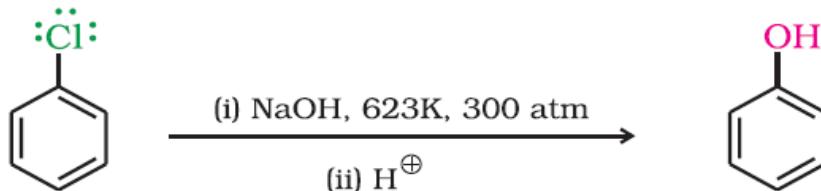
## **(NCERT BASED NOTES OF CHAPTER - 10)**

**GANESH KUMAR**      **DATE:- 23/08/2021**

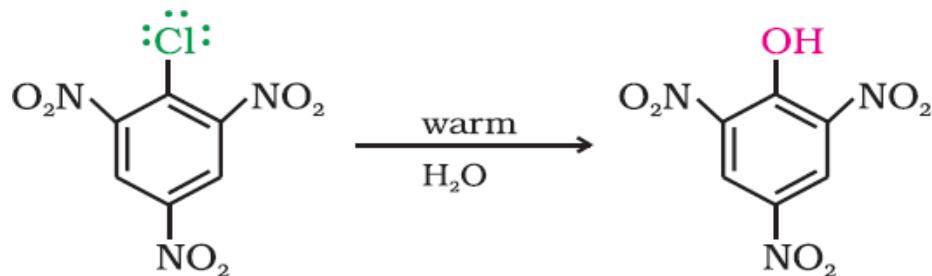
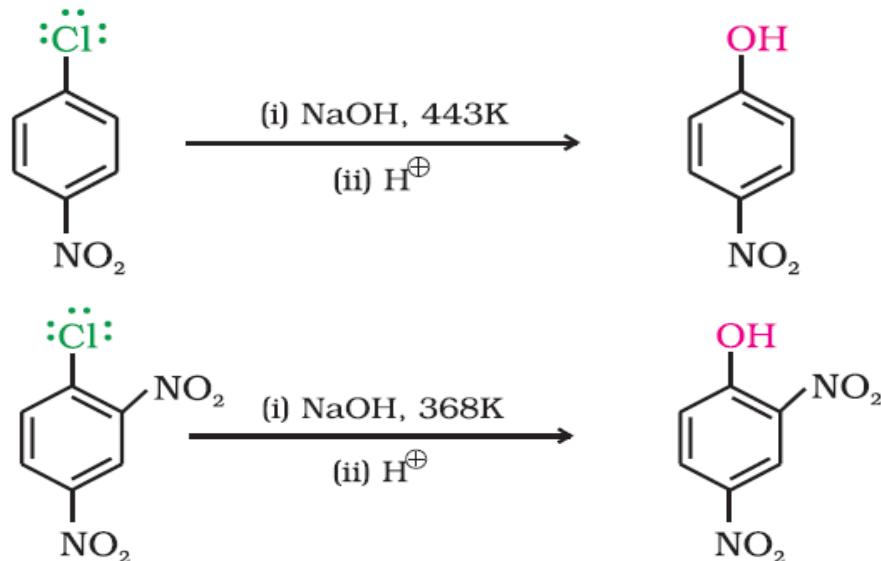
# Haloalkanes and Haloarenes

## **Replacement by hydroxyl group (Conversion to phenol)**

Chlorobenzene when heated with aqueous sodium hydroxide solution at a temperature of 623K and a pressure of 300 atmospheres followed by acidification, we get phenol.



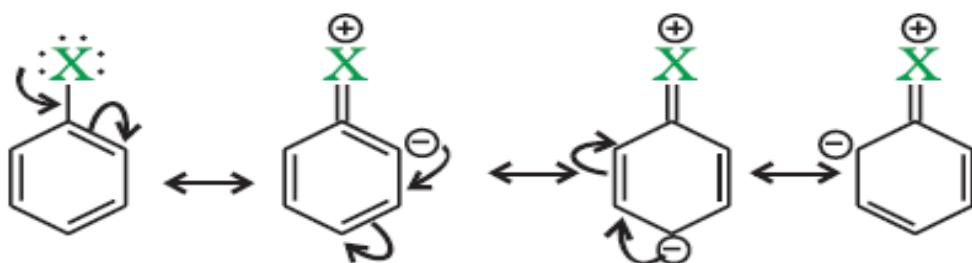
The presence of an electron withdrawing group ( $\text{-NO}_2$ ) at ortho- and para-positions increases the reactivity of haloarenes.



The effect is more when  $\text{-NO}_2$  group are present at ortho and para- positions. However, no effect on reactivity is observed by the presence of electron withdrawing group at meta-position.

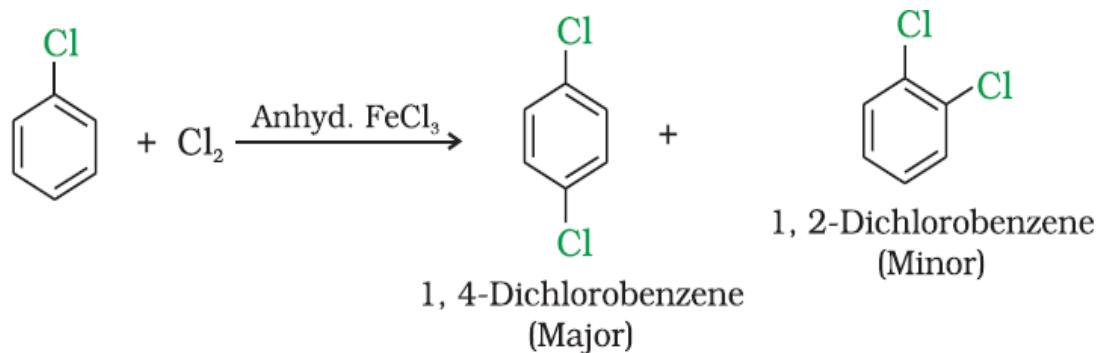
## Electrophilic substitution reactions:

Haloalkanes are resonance stabilized as follows:

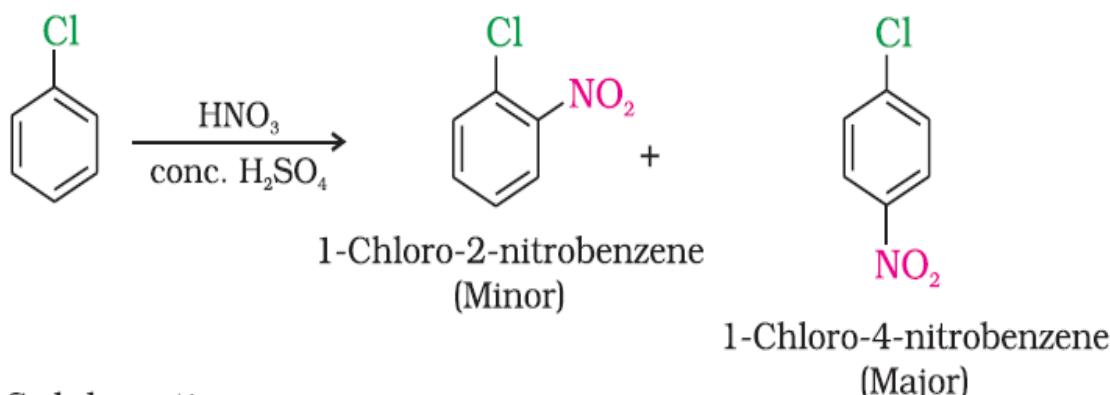


In the resonating structures, the electron density is greater on ortho-para positions. So the electrophile enters at these positions and hence halo group is an *ortho-para directing group*. Also because of its  $-I$  effect, the halogen atom has a tendency to withdraw electrons from the benzene ring. So it is a *deactivating group*. Hence the electrophilic substitution reactions in haloarenes occur slowly and require more vigorous conditions.

i) **Halogenation:** Haloalkanes react with halogen (Chlorine or bromine) in presence of anhydrous ferric chloride to form o-dichlorobenzene and p-dichlorobenzene.

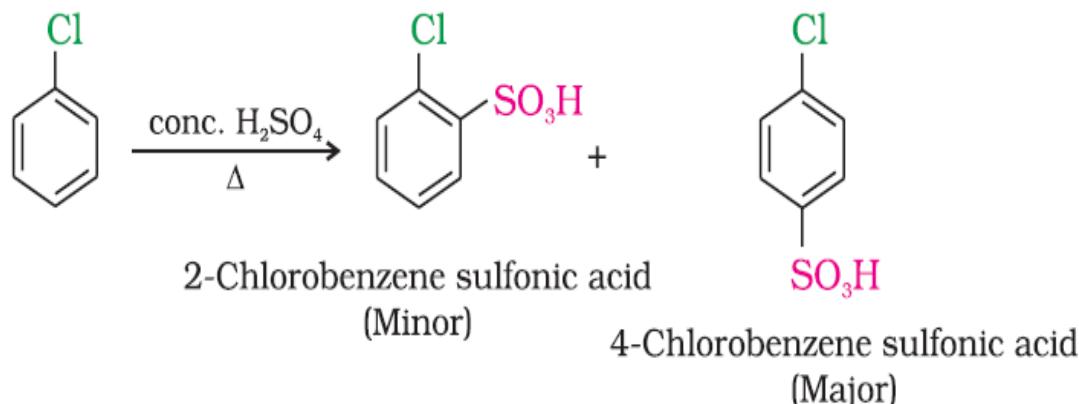


ii) **Nitration:** On nitration using Conc.  $\text{HNO}_3$  and Conc.  $\text{H}_2\text{SO}_4$ , chlorobenzene gives p-nitro chlorobenzene as the major product.

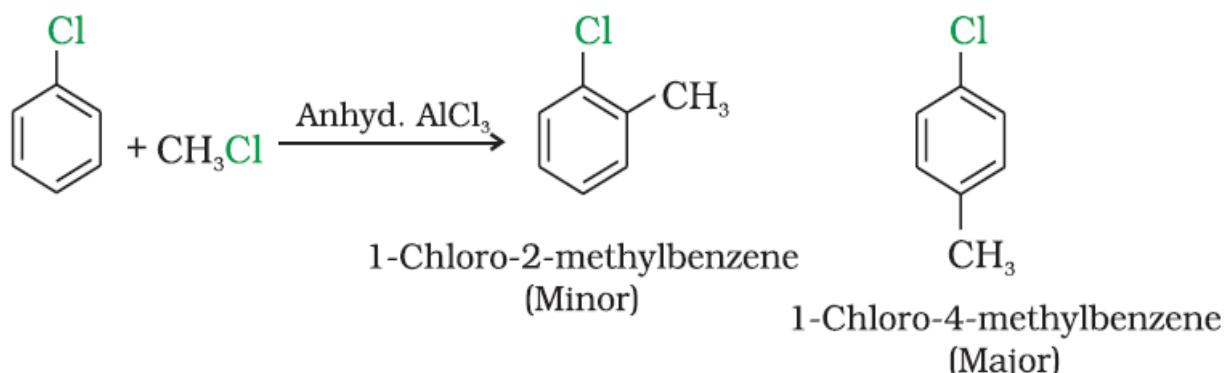


## **Electrophilic substitution reactions:**

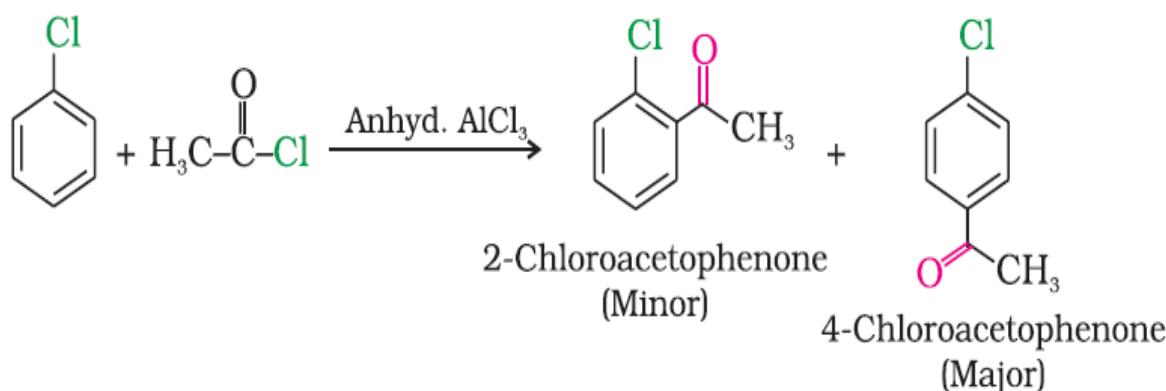
**(iii) Sulphonation:** On sulphonation using Conc.  $\text{H}_2\text{SO}_4$ , chlorobenzene gives p-chloro benzenesulphonic acid as the major product.



**(iv) Friedel – Crafts Alkylation:** Chlorobenzene when treated with methyl chloride ( $\text{CH}_3\text{-Cl}$ ) in presence of anhydrous  $\text{AlCl}_3$ , we get p-chlorotoluene as the major product.

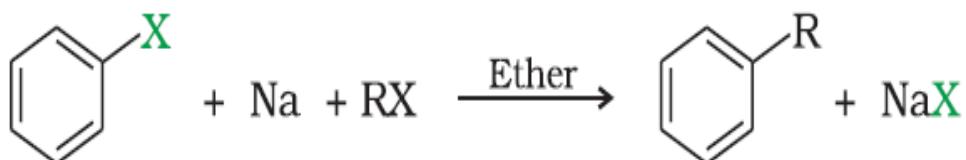


**(v) Friedel – Crafts Acylation:** Chlorobenzene when treated with acetyl chloride ( $\text{CH}_3\text{-CO-Cl}$ ) in presence of anhydrous  $\text{AlCl}_3$ , we get p-chloroacetophenone as the major product.

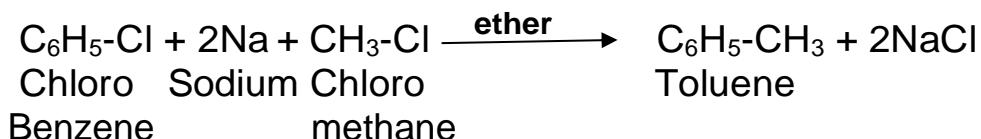


## Reaction with metals:

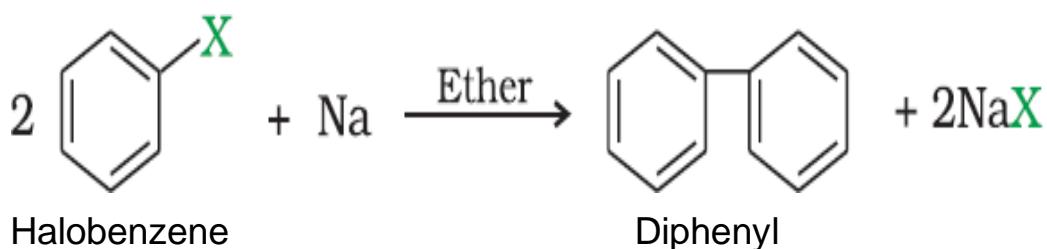
a) **Wurtz-Fittig reaction:** When a mixture of alkyl halide and aryl halide is treated with sodium in dry ether, an alkyl arene is formed and this reaction is called Wurtz-Fittig reaction.



For e.g. when Chlorobenzene is treated with methyl chloride in presence of metallic sodium in ether medium, we get toluene.



b) **Fittig reaction:** Aryl halides when treated with sodium in dry ether, we get diaryls (diphenyls). This reaction is called Fittig reaction.



\*\*\*\*\*The End\*\*\*\*\*