31 Halogen compounds

Formation of halogenoarenes

Halogenoarenes can be produced by a substitution reaction with Cl_2 or Br_2 in the presence of a catalyst, $AlCl_3$ or $AlBr_3$, to form the chloro- or bromo-halogenoarene. In the case of benzene, this is chlorobenzene (Figure 31.1) or in the case of methylbenzene, 2-chloromethylbenzene and 4-chloromethylbenzene (Figure 31.2).

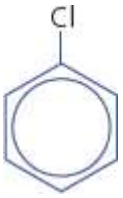

Figure 31.1 Chlorobenzene – formed from benzene

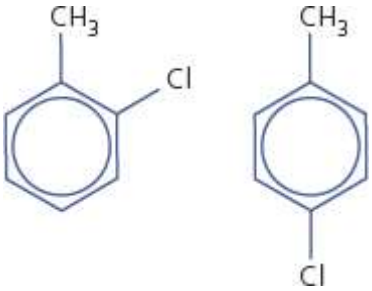

Figure 31.2 The two products from methylbenzene – 2-chloromethylbenzene and 4-chloromethylbenzene

Reactivity of the halogenoarenes

Chlorobenzene is much less reactive towards nucleophilic substitution than the chloroalkanes. The C–Cl bond in the molecule is stronger than expected. This is because one of the lone pairs of electrons on the chlorine atom delocalises with the ring electrons on benzene (Figure 31.3).

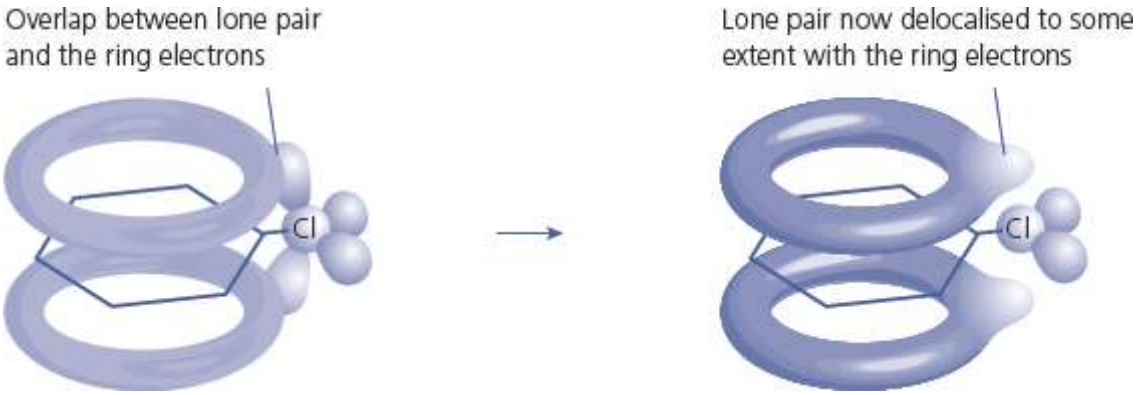

Figure 31.3 Chlorobenzene – showing delocalisation of a lone pair on chlorine

REVISION ACTIVITY

a Using your knowledge of bonding in aromatic compounds, explain why chlorobenzene is much less reactive towards nucleophilic substitution than 1-chlorohexane is.

b Describe and explain the difference in products formed when benzene and methylbenzene are separately reacted with bromine in the presence of $AlBr_3$.

END OF CHAPTER CHECK

By now you should be able to:

- recall the reactions by which halogenoarenes can be produced
- explain the difference in reactivity between a halogenoalkane and a halogenoarene