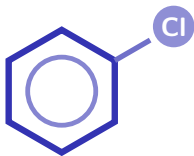


Halogen Compounds

A-Level Chemistry ■ Topic 31

A-Level Chemistry



What we will cover

1 Making halogenoarenes

2 Why they are unreactive



*many pesticides are
halogenoarenes*

Making halogenoarenes

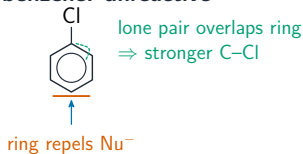
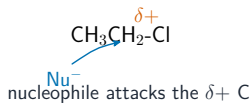


A **halogenoarene** 卤代芳烃 forms when an arene reacts with Cl_2 or Br_2 with an AlCl_3 **catalyst** 催化剂.

This is **electrophilic substitution** 亲电取代 – the halogen replaces an H on the ring (benzene $\rightarrow$ chlorobenzene).

Why they are unreactive

chloroethane: **reactive** chlorobenzene: **unreactive**



A halogenoarene resists

nucleophilic

substitution 亲核取代 (unlike a halogenoalkane):

- the Cl **lone pair** 孤对电子 overlaps the ring, strengthening the C-Cl bond
- the electron-rich ring **repels** a nucleophile

Worked example – why won't chlorobenzene react?

Explain why chlorobenzene does not hydrolyse with aqueous NaOH but chloroethane does.

- In chlorobenzene a **Cl lone pair overlaps** with the ring's delocalised π system.
- That gives the C–Cl bond partial **double-bond character**: shorter and stronger.
- The ring's π electrons also **repel** the approaching OH^- nucleophile.
- In chloroethane C–Cl is a plain polar single bond $\Rightarrow$ **hydrolyses on reflux**.

Delocalisation into the ring **strengthens** C–Cl.
The same reason phenol's C–O will not substitute either.

Topic 31 – key takeaways

1

Making

electrophilic substitution with AlCl_3

2

Halogenoalkane

reacts by nucleophilic substitution

3

Halogenoarene

the lone pair strengthens the C–Cl bond

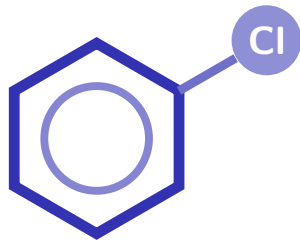
4

Ring

electron-rich ring repels nucleophiles

Check yourself

- 1 What catalyst makes a halogenoarene?
- 2 Which mechanism makes a halogenoarene?
- 3 Why is the C–Cl bond stronger in chlorobenzene?
- 4 Does chlorobenzene react with OH^- normally?



Answers 1. AlCl_3 2. electrophilic substitution 3. the Cl lone pair overlaps the ring
4. no