

15 Halogenoalkanes – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English	Write it 3 times (English)		
halogenoalkanes	_____	_____	_____
polar	_____	_____	_____
nucleophile	_____	_____	_____
primary	_____	_____	_____
secondary	_____	_____	_____
tertiary	_____	_____	_____
nucleophilic substitution	_____	_____	_____
alcohol	_____	_____	_____
nitrile	_____	_____	_____
amine	_____	_____	_____
silver nitrate	_____	_____	_____
precipitate	_____	_____	_____

Recall

You met **halogenoalkanes** when an alkane or alkene reacts with a halogen. A halogenoalkane has a **C–X bond** (X = a halogen) in place of a C–H bond.

- The C–X bond is **polar**, so the carbon is slightly positive ($\delta+$).
- This $\delta+$ carbon is open to attack by a **nucleophile**.

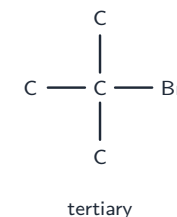
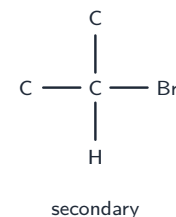
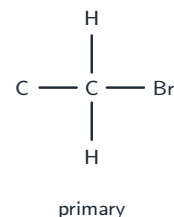
Nothing here is harder than IGCSE – it just adds the reactions.

New ideas

Read these first, then do the Practice.

■ 1 Three classes

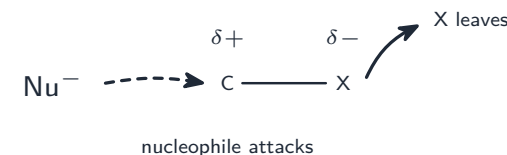
A halogenoalkane is **primary**, **secondary** or **tertiary**, set by how many carbons are joined to the carbon holding the halogen (one, two or three).



■ 2 Nucleophilic substitution

A **nucleophile** (a lone-pair species) attacks the $\delta+$ carbon and replaces the halogen – a **nucleophilic substitution**:

Reagent	Product
NaOH(aq), heat	an alcohol
KCN in ethanol	a nitrile (adds a carbon)
NH ₃ in ethanol	an amine



■ 3 Identifying the halogen

Warm with **silver nitrate** in ethanol; the silver halide **precipitate** colour shows which halogen (white AgCl, cream AgBr, yellow AgI).

Watch out: primary/secondary/tertiary is decided by how many *carbons* are joined to the carbon holding the halogen – not by the number of halogen atoms. The nucleophile always attacks that $\delta+$ carbon.

Practice

Try these in order.

15.1 What is a halogenoalkane? [1]

15.2 What decides whether a halogenoalkane is primary, secondary or tertiary? [1]

15.3 Why is the carbon of the C–X bond open to attack by a nucleophile? [2]

15.4 Name the product when a halogenoalkane reacts with (a) NaOH(aq), (b) NH₃ in ethanol. [2]

15.5 Describe how you would identify the halogen in a halogenoalkane. [2]

15.6 Challenge. A halogenoalkane is warmed with KCN (a source of CN[−]) in ethanol. Name the type of reaction, and explain why the product has one *more* carbon than the halogenoalkane. [2]