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.

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

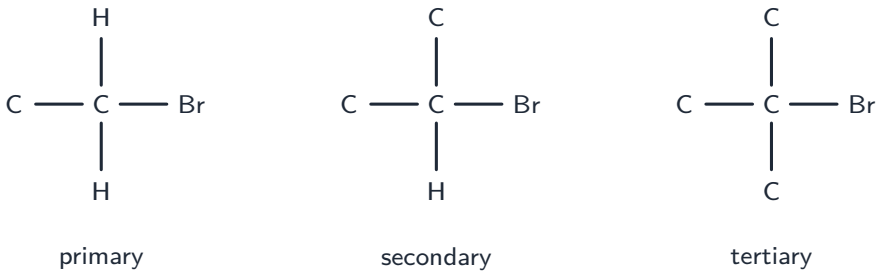
Nothing here is harder than IGCSE – it just adds the reactions.

New ideas

Read these first, then do the Practice.

1 Three classes

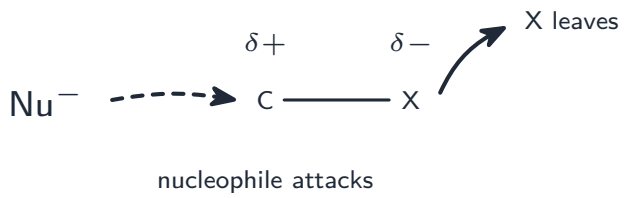
A halogenoalkane is **primary** , **secondary** or **tertiary** , set by how many carbons are joined to the carbon holding the halogen (one, two or three).



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) NH_3 in ethanol. [2]

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

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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]