

15 Halogenoalkanes – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English

Write it 3 times (English)

alkene

substitution

elimination

C–X bond energy

Recall

From Part 1 you know a halogenoalkane reacts with NaOH to give an alcohol. But the **same** halogenoalkane can instead lose HX to make an **alkene** – the conditions decide which.

- Different solvents send the reaction down different routes.
- Reactivity also depends on which halogen is present.

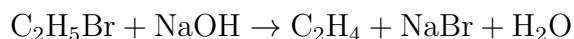
New ideas

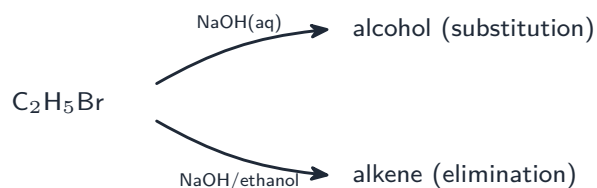
Read these first, then do the Practice.

■ 1 Substitution vs elimination

The conditions decide the reaction:

- NaOH in **water**, heat → **substitution** → an alcohol.
- NaOH in **ethanol**, heat → **elimination** → an alkene.

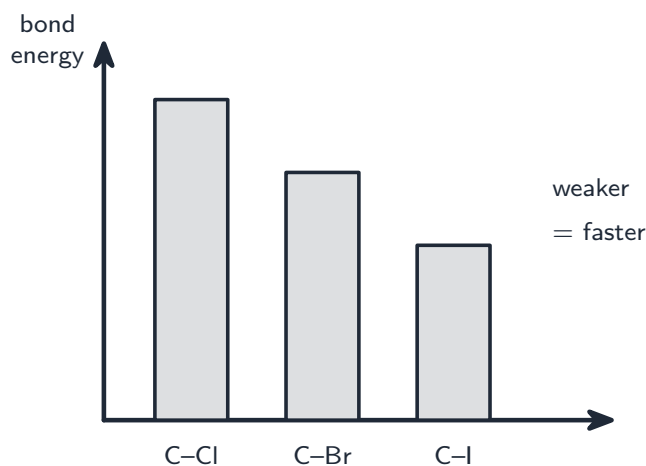




■ 2 Reactivity and the C–X bond

How fast a halogenoalkane reacts depends on the **C–X bond energy** (bond strength):

- the **C–I** bond is **weakest**, so iodoalkanes react **fastest**.
- the **C–Cl** bond is **strongest** of the three, so chloroalkanes react **slowest**.



So with silver nitrate, the iodoalkane gives its precipitate first.

Watch out: the *same* halogenoalkane gives an alcohol (substitution) in *aqueous* NaOH, but an alkene (elimination) in *ethanolic* NaOH – the solvent decides the route. And the weakest bond (C–I) reacts fastest.

Practice

Try these in order.

15.1 State the conditions that make a halogenoalkane react by (a) substitution, (b) elimination. [2]

15.2 What product is formed by the elimination reaction? [1]

15.3 Write the equation for bromoethane reacting with NaOH in ethanol. [2]

15.4 Which reacts faster, an iodoalkane or a chloroalkane? Explain why. [2]

15.5 Which C–X bond is the strongest of C–Cl, C–Br and C–I? [1]

15.6 Challenge. 1-chlorobutane and 1-iodobutane are each warmed with aqueous silver nitrate. Predict which gives a precipitate first, and explain. [2]
