

Halogenoalkanes Summary Map

Edexcel A Level Chemistry · Topic 6 Organic Chemistry I · 6D Halogenoalkanes

1 Reactions and attackers

6A.5, 6D.36, 6D.31

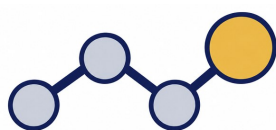
- Addition, elimination, **substitution**, hydrolysis
- Nucleophile**: electron-pair donor
- Heterolytic fission: both electrons to X
- Polar C–X: δ^+ C attracts nucleophiles



2 Names and classes

6A.4, 6D.30

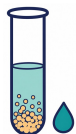
- Halogen as a **prefix**: 2-bromobutane
- Lowest numbers; alphabetical prefixes
- Carbons on C–X: **1° 2° 3°**
- Skeletal: halogen always written



3 Hydroxide and water

6D.32 i–ii, 6D.36 i

- KOH(aq), warm**: alcohol
- Lone pair on O $\rightarrow$ δ^+ C; C–X pair $\rightarrow$ X
- Water: weaker nucleophile, no charge
- AgNO_3 in ethanol: AgX precipitate



4 Ammonia and cyanide

6D.32 iii–iv, 6D.36 ii

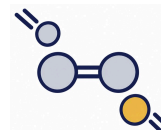
- Excess NH_3** , ethanol, sealed tube: amine
- Second NH_3 removes H^+
- KCN in ethanol**, reflux: nitrile
- New C–C: chain one longer



5 Elimination

6D.32 v

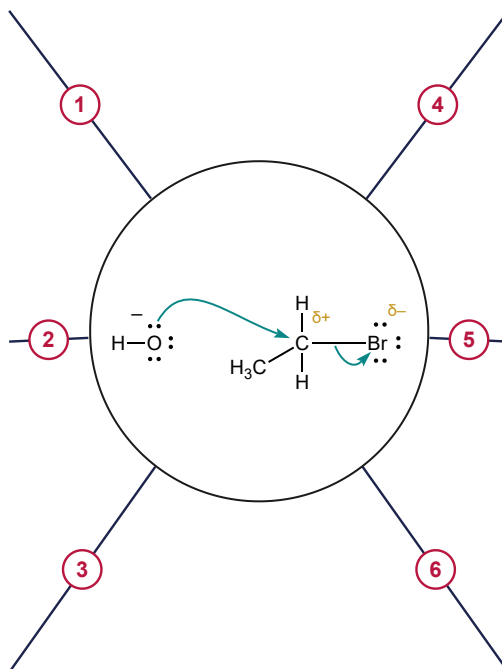
- KOH in ethanol, hot**: alkene
- OH^- acts as a **base**: takes H^+
- H and X from neighbouring carbons
- Several alkenes: check E/Z



6 Rates of hydrolysis

6D.33–6D.35, CP4

- Time to the precipitate: rate $\propto 1/t$
- C–I weakest: **iodo fastest**
- Bond enthalpy, not polarity
- Tertiary > secondary > primary**



One halogenoalkane, five products bromoethane, $\text{CH}_3\text{CH}_2\text{Br}$; KOH aqueous for substitution, ethanolic for elimination

Reagent	Conditions	Product	OH^- , NH_3 or CN^- acts as
KOH(aq)	warm, reflux	ethanol	nucleophile
H_2O (AgNO_3)	ethanol, warm	ethanol + AgBr	nucleophile (water)
NH_3 (excess)	ethanol, sealed tube, heat	ethylamine	nucleophile, then base
KCN	ethanol, reflux	propanenitrile	nucleophile
KOH in ethanol	hot	ethene	base

Worked examples

Name and class

- $(\text{CH}_3)_3\text{CBr}$
- 2-bromo-2-methylpropane
- C–Br carbon has 3 C: **tertiary**

Three alkenes

- 2-bromobutane, hot ethanolic KOH
- but-1-ene
- E** and **Z** but-2-ene

Which is faster?

- 1-iodo- or 1-chloropropane
- C–I 228, C–Cl 346 kJ mol^{-1}
- iodo**: weaker bond

Halogenoalkanes link alkanes and alkenes to alcohols (Topic 6E), amines and nitriles; SN1 and SN2 follow in Topic 17.



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