Solutions

Each answer shows the steps, then the **result**.

2.1

- aqueous sodium hydroxide, NaOH(aq); and heat

2.2

- a nitrile

2.3

- **secondary**

2.4

- $CH_3CH_2CH_2Br + NaOH \rightarrow CH_3CH_2CH_2OH + NaBr$

3.1 B

- NaOH in ethanol with heat favours elimination

3.2 C

- The C–I bond is weakest, so the iodoalkane reacts fastest

3.3

(a)

- the OH^- nucleophile attacks the $\delta+$ carbon (curly arrow from the lone pair); at the same time the C–Br bond breaks, with both electrons going to Br; passing through a transition state with both half-bonded, giving ethanol and Br^-

(b)

- the tertiary carbocation is stabilised by three electron-pushing alkyl groups, so the C–X bond breaks first to form it (S_N1)

3.4

- the C–I bond is weaker (lower bond energy) than C–Cl, so it breaks more easily, making the substitution faster

3.5

(a)

- **propene**
- **elimination**

(b)

- **propan-2-ol**

3.6

- add the same volume of each halogenoalkane to equal volumes of silver nitrate in ethanol, at the same temperature (in a water bath)
- time how long each takes for a precipitate to appear
- the iodoalkane gives a (yellow) precipitate fastest, then the bromo-, then the chloroalkane, because the C–I bond is the weakest