Solutions

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

2.1

- a species with a lone pair that is attracted to (attacks) an electron-poor / positive centre

2.2

- homolytic fission

3.1 B

- Heterolytic fission gives both electrons to one atom, producing two ions

3.2 C

- Removing a small molecule to form a double bond is elimination

3.3

(a)

- homolytic — the bond splits evenly, one electron to each atom (two radicals); heterolytic — both electrons go to one atom (two ions)

(b)

- initiation; propagation; termination

3.4

- the C=C bond is an electron-rich region (high electron density); electrophiles are electron-deficient and are attracted to it

3.5

(a)

- Nucleophilic substitution; by the S_N1 mechanism

(b)

- A nucleophile is an electron-pair donor that attacks an electron-deficient, $\delta+$ carbon; here it is the hydroxide ion, OH^-

(c)

- In heterolytic fission **both** bonding electrons go to one of the two atoms, so the bond breaks unevenly; it gives a bromide ion, Br^- and a tertiary carbocation, $(CH_3)_3C^+$

(d)

- S_N2. The tertiary carbocation is stabilised by the electron-releasing inductive effect of **three** alkyl groups, which spread the positive charge; a primary carbocation has

only one such group, so it is far less stable and does not form readily; the hydroxide therefore attacks the $\delta+$ carbon directly in a single step, from the side opposite the bromine