Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

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

2.1

nucleophile: an electron-pair donor; electrophile: an electron-pair acceptor

2.2

H_2O nucleophile; NO_2^+ electrophile; CN^- nucleophile

2.3

$CH_3CH_2Br + OH^- \rightarrow CH_3CH_2OH + Br^-$; ethanol; nucleophilic substitution

2.4

orange to colourless; $C_2H_4 + Br_2 \rightarrow CH_2BrCH_2Br$; electrophilic addition

3.1

(a) the halogen is more electronegative, so the carbon is $\delta+$; it attracts the lone pair of the nucleophile

(b) 1-bromobutane; the C–Br bond is weaker than the C–Cl bond, so it breaks more easily

(c) butan-1-ol

(d) heterolytic

3.2

(a) shake with bromine water: orange to colourless

(b) $CH_3CH{=}CH_2 + Br_2 \rightarrow CH_3CHBrCH_2Br$; 1,2-dibromopropane

(c) phosphoric acid / sulfuric acid; propan-2-ol / propan-1-ol

(d) the electron-rich C=C repels the electrons in Br_2, so the molecule becomes polarized; the $\delta+$ bromine atom accepts an electron pair from the C=C