Solutions

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

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

2.1

- aldehyde: C=O at the end of the chain, bonded to an H
- ketone: C=O bonded to two carbon atoms

2.2

- 2,4-DNPH: orange precipitate

2.3

- propanal
- propanone

3.1

- the lone pair on CN^- attacks the $C^{\delta+}$ of C=O
- the π electrons move onto O, forming an O^- intermediate
- the O^- takes H^+ (from HCN or the acid)
- 2-hydroxypropanenitrile

3.2

- $NaBH_4$
- propan-2-ol

3.3

- warm with Tollens' reagent: propanal gives a silver mirror; propanone no change
- warm with Fehling's solution / acidified dichromate: propanal gives brick-red precipitate / green; propanone no change

3.4

- ethanal, propanone and butanone
- each contains a CH_3CO- group

3.5

- HCN is a very toxic gas
- making it in situ keeps the amount small and contained; KCN supplies the CN^- nucleophile

3.6

(a) 2,4-DNPH: a carbonyl compound; no silver mirror: a ketone; iodine: contains CH_3CO-; **P** is $CH_3COCH_2CH_3$, butanone

(b) butan-2-ol

(c) 2-hydroxy-2-methylbutanenitrile; yes: C2 has OH, CN, CH_3 and C_2H_5

(d) $CH_3CH_2CH_2CHO$; $(CH_3)_2CHCHO$

(e) $C_3H_7CHO + [O] \rightarrow C_3H_7COOH$

(f) the planar C=O is attacked equally from either side, giving a racemic mixture whose rotations cancel