

Oxidising alcohols and testing carbonyl compounds

Chemistry grades 11-12 (A Level · IB · Class 11-12) · Test answers (mark scheme)

The answers include a mark scheme. Give full credit for correct reasoning even if the wording differs, but do not accept "clear" for colourless or a silver mirror for a ketone. Check units and significant figures in the calculation.

Level: Chemistry grades 11-12 (A Level · IB · Class 11-12) · **Curriculum:** A Level 3.3.5

Question 1 Oxidising butan-2-ol (3 marks)

- a. Secondary.
- b. **Butanone.**
- c. Orange to green.

Marking: 1 mark each.

Question 2 Reflux or distillation (2 marks)

- a. Distillation: **propanal**; reflux: **propanoic acid**.
- b. Propanal has no hydrogen bonding, so it boils at a lower temperature than the alcohol and escapes before further oxidation.

Marking: 1 for both names; 1 for the explanation.

Question 3 Tollens' reagent (3 marks)

- a. Ethanal: a silver mirror forms. Propanone: no change.
- b. They are reduced to silver metal ($\text{Ag}^+ + \text{e}^- \rightarrow \text{Ag}$).

Marking: 1 for each observation; 1 for reduction.

Question 4 Propanone and HCN (3 marks)

- a. **Nucleophilic addition.**
- b. $(\text{CH}_3)_2\text{C}(\text{OH})\text{CN}$, 2-hydroxy-2-methylpropanenitrile.
- c. It has two identical CH_3 groups, so there is no chiral centre.

Marking: 1 mark each.

Question 5 Yield calculation (3 marks)

- a. $n = 4.60 / 46.0 = 0.100$ mol; mass = $0.100 \times 60.0 = \mathbf{6.00\text{ g}}$.
- b. $0.80 \times 6.00 = \mathbf{4.80\text{ g}}$.

Marking: 1 for amount; 1 for mass; 1 for 4.80 g.

Question 6 Racemic product (2 marks)

- a. An equal mixture of two enantiomers.
- b. The planar C=O is attacked equally from each face by CN^- .

Marking: 1 mark each.

Question 7 Boiling points (2 marks)

- a. Hydrogen bonding.
- b. Propanal has no O-H group, so only weaker dipole-dipole forces act between its molecules.

Marking: 1 mark each.

Question 8 Identify by tests (2 marks)

- a. **Propanone**.
- b. DNPH shows a carbonyl group; no reaction with Fehling's solution shows it is a ketone, not an aldehyde.

Marking: 1 mark each.