

Question 36 (Answer: D)

- Adding HCN across a C=O adds exactly one carbon atom.
- R has four carbons, so Q must have three.
- Q also needs a carbonyl group for nucleophilic addition, so it is the three-carbon aldehyde or ketone.

Question 38 (Answer: C)

- The iodoform test gives a yellow precipitate only for a CH₃CO– group.
- Among the seven carbonyls with four or fewer carbons, that is ethanal, propanone and butanone.
- Methanal, propanal, butanal and 2-methylpropanal all lack it, so three react.

Question 34 (Answer: B)

- The ethyl carbanion attacks the δ^+ carbon of the C=O.
- Protonating the resulting alkoxide gives an alcohol.
- That carbon ends up bonded to two original alkyl chains plus the new ethyl group, so the product is a *tertiary* alcohol.

Question 34 (Answer: B)

- The orange precipitate with 2,4-DNPH shows a carbonyl group is present.
- No reaction with Tollens' rules out an aldehyde, so it must be a ketone.
- The yellow precipitate with alkaline iodine needs a CH₃CO– group, so it is a methyl ketone.

Question 35 (Answer: D)

- The nucleophile is the cyanide ion, and it attacks using its lone pair on carbon – not a π bond.
- It attacks the δ^+ carbon of the C=O, pushing the π electrons onto the oxygen.
- The negatively charged oxygen then takes a proton from HCN.

7(a)	M1: Q CH ₃ CH ₂ CH(CH ₃)CHO M2: $\begin{array}{c} \text{C}_2\text{H}_5 \\ \\ \text{C} \\ / \quad \backslash \\ \text{HOC} \quad \text{H} \\ \quad \backslash \\ \quad \text{CH}_3 \end{array}$ AND $\begin{array}{c} \text{C}_2\text{H}_5 \\ \\ \text{C} \\ / \quad \backslash \\ \text{H} \quad \text{CHO} \\ \backslash \\ \text{H}_3\text{C} \end{array}$
7(b)(i)	T CH ₃ CH ₂ CH ₂ COCH ₃ AND V (CH ₃) ₂ CHCOCH ₃
7(b)(ii)	• yellow solid • CH₃CH₂CH₂COOH OR (CH₃)₂CHCOOH • CHI₃ Any two [1], all three [2]
7(c)(i)	S (CH ₃) ₃ CCHO

7(c)(ii)	U $\text{CH}_3\text{CH}_2\text{COCH}_2\text{CH}_3$
7(c)(iii)	triplet AND two hydrogen atoms on neighbouring carbon atoms
7(c)(iv)	TMS / tetramethylsilane / $\text{Si}(\text{CH}_3)_4$
7(d)	4 3 5 3 Any two [1], all four [2]