

Question 40 (Answer: D)

- Each functional group absorbs in its own characteristic wavenumber range.
- An impurity shows up as an absorption that the pure compound's groups cannot account for.
- So match every observed peak against the table, and look for one that the intended structure cannot explain.

4(a)(i)	free-radical substitution
4(a)(ii)	M1 $\text{C}_3\text{H}_8 + \text{Cl}^\bullet \rightarrow \text{CH}_3\text{CH}_2\text{CH}_2^\bullet + \text{HCl}$ OR $\text{C}_3\text{H}_8 + \text{Cl}^\bullet \rightarrow \text{C}_3\text{H}_7^\bullet + \text{HCl}$ M2 $\text{CH}_3\text{CH}_2\text{CH}_2^\bullet + \text{Cl}_2 \rightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{Cl} + \text{Cl}^\bullet$ OR $\text{C}_3\text{H}_7^\bullet + \text{Cl}_2 \rightarrow \text{C}_3\text{H}_7\text{Cl} + \text{Cl}^\bullet$ etc M3 $\text{CH}_3\text{CH}_2\text{CH}_2^\bullet + \text{Cl}^\bullet \rightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$ OR $\text{C}_3\text{H}_7^\bullet + \text{Cl}^\bullet \rightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$
4(a)(iii)	homolytic
4(a)(iv)	1,2-dichloropropane
4(a)(v)	M1 (type of structural isomerism) positional M2 (type of stereoisomerism) optical
4(b)	sodium hydroxide AND water
4(c)(i)	orange to green
4(c)(ii)	$\text{CH}_3\text{CH}_2\text{CH}_2\text{OH} + 2[\text{O}] \rightarrow \text{CH}_3\text{CH}_2\text{COOH} + \text{H}_2\text{O}$
4(d)(i)	condensation
4(d)(ii)	M1 absorption labelled at approx. 1750 cm^{-1} identified as C=O M2 absorption labelled at approx. 1650 cm^{-1} identified as C=C M3 absorption labelled at approx. 1170 cm^{-1} identified as C—O
4(d)(iii)	$(0.31 / 4.7 \times 100 / 1.1) = 6$ carbon atoms