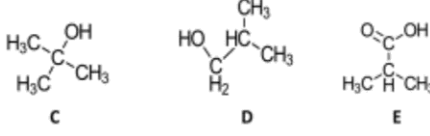


4(b)(i)	C = (2-)methylpropan-2-ol / $(\text{CH}_3)_3\text{COH}$ / any unambiguous structure	1
	D = (2-)methylpropan-1-ol / $(\text{CH}_3)_2\text{CHCH}_2\text{OH}$ / any unambiguous structure	1
	E = (2-)methylpropanoic acid / $(\text{CH}_3)_2\text{CHCO}_2\text{H}$ / any unambiguous structure	1
		

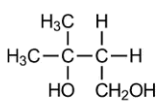
May/June 2017 9701/22 · Q4 (b)(i)

2(c)(iii)	$2\text{NaBr} + 2\text{H}_2\text{SO}_4 \rightarrow \text{Br}_2 + \text{SO}_2 + \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$ OR $\text{NaBr} + \text{H}_2\text{SO}_4 \rightarrow \text{NaHSO}_4 + \text{HBr}$ AND $2\text{HBr} + \text{H}_2\text{SO}_4 \rightarrow \text{Br}_2 + \text{SO}_2 + 2\text{H}_2\text{O}$ OR $2\text{NaBr} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + 2\text{HBr}$ AND $2\text{HBr} + \text{H}_2\text{SO}_4 \rightarrow \text{Br}_2 + \text{SO}_2 + 2\text{H}_2\text{O}$	2
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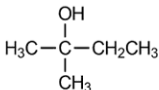
May/June 2017 9701/23 · Q2 (c)(iii)

4(c)(iii)		alcohol group present in Z
	primary	✓
	secondary	✓
	tertiary	

May/June 2019 9701/21 · Q4 (c)(iii)

4(b)(i)		1
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Oct/Nov 2019 9701/22 · Q4 (b)(i)

2(e)(i)	in the same phase / state	1
2(e)(iii)		1
2(e)(iv)	substitution	1

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Question	Answer	Marks
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March 2020 9701/22 · Q2 (e)(i), (e)(iii), (e)(iv)

4(b)(i)	HI(g) / PI_3 / P and I_2	1
4(c)(v)	ethanoic acid / CH_3COOH	1

Oct/Nov 2020 9701/21 · Q4 (b)(i), (c)(v)

3(c)(i)	LiAlH_4 OR lithium tetrahydridoaluminate(III)	1
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Oct/Nov 2020 9701/22 · Q3 (c)(i)

4(c)(i)	oxidising agent	1
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March 2021 9701/22 · Q4 (c)(i)

5(b)(i)	2-bromobutane	1
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May/June 2021 9701/22 · Q5 (b)(i)

2(d)(ii)	$\text{CH}_3\text{CH}_2\text{CN}$	$\text{CH}_3\text{CH}_2\text{CO}_2\text{H}$	3
	$\text{CH}_3\text{C}(\text{OH})(\text{CN})\text{CH}_3$		

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Question	Answer	Marks
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Oct/Nov 2021 9701/21 · Q2 (d)(ii)

2(b)(iii)	two lines shown on diagram, e.g. E_A and $E_{A,\text{cat}}$ [1] greater proportion of molecules with $E \geq E_A$ [1] frequency of effective collisions increases [1]	3
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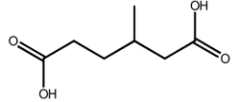
Question	Answer	Marks
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March 2022 9701/22 · Q2 (b)(iii)

3(e)(iii)	M1: (water solvent) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ / propan-1-ol	AND NaBr / sodium bromide	2
	M2: (ethanol solvent) CH_3CHCH_2 / propene	AND H_2O / water AND NaBr / sodium bromide	

Question	Answer	Marks
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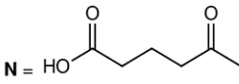
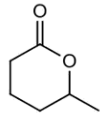
March 2022 9701/22 · Q3 (e)(iii)

3(b)	 OR $(\text{CH}_3)_2\text{CO}$  OR $\text{HOOC}(\text{CH}_2)_2\text{CH}(\text{CH}_3)\text{CH}_2\text{COOH}$	2
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May/June 2022 9701/21 · Q3 (b)

4(b)(ii)	$\text{I}^- + \text{Ag}^+ \rightarrow \text{AgI}$	1
4(b)(iii)	M AND C–I (bond) is weak(er)	1

May/June 2022 9701/23 · Q4 (b)(ii), (b)(iii)

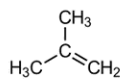
5(a)(i)		1
5(a)(ii)	$C_6H_{10}O_3 + 2[H] \rightarrow C_6H_{12}O_3$	1
5(a)(iii)	M1 (ketone in N is planar (so can be attacked from either side)	1
	M2 because different stereoisomers / optical isomers form	1
5(a)(iv)		1

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Question	Answer	Marks
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Oct/Nov 2022 9701/21 · Q5 (a)(i), (a)(ii), (a)(iii), (a)(iv)

1(e)(iii)		1
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Question	Answer	Marks
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Oct/Nov 2022 9701/22 · Q1 (e)(iii)

3(c)(v)	$(1)H_2O + (1)[O] + C_3H_5Br \rightarrow C_3H_7BrO_2$	1
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Oct/Nov 2022 9701/22 · Q3 (c)(v)

3(c)(i)	substitution	1
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Oct/Nov 2022 9701/23 · Q3 (c)(i)

3(b)	acid (conditions) / $H^+(aq)$ AND heat under reflux	1
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May/June 2023 9701/22 · Q3 (b)

4(c)(vi)	M1 (propan-2-ol is produced via a) more stable carbocation OR more stable intermediate OR $(CH_3)_2C^+H$ is more stable M2 (positive) inductive effect of more alkyl/methyl groups OR more electron donating alkyl / methyl groups OR greater electron donating effect of two alkyl / two methyl groups	2
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May/June 2023 9701/22 · Q4 (c)(vi)

6(c)(iii)	$ROH + Na \rightarrow RONa + 1/2 H_2$ (0.002 mol Q produced 0.002 mol H_2 gas so) 2 OH groups M1 answer indicates that OH group(s) in Q react with Na to produce the H_2 in the ratio 1 mol OH : $1/2$ mol H_2 M2 uses data to show 2OH groups	2
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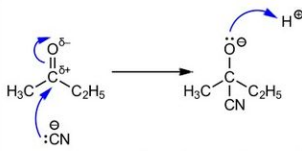
May/June 2024 9701/21 · Q6 (c)(iii)

5(b)(ii)	 OR $\text{CH}_3\text{CH}_2\text{CO}(\text{CH}_3)$	1
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May/June 2024 9701/22 · Q5 (b)(ii)

5(d)(i)	W =	1
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May/June 2024 9701/23 · Q5 (d)(i)

4(a)	acidified $\text{K}_2\text{Cr}_2\text{O}_7(\text{aq})$	(solution) turns (from orange to) green	J and L	5
	alkaline $\text{I}_2(\text{aq})$	yellow precipitate forms	K and L	
	2,4-dinitrophenylhydrazine / 2,4-DNPH	orange precipitate forms	J and K	
	$\text{Na}(\text{s})$	effervescence	L and M	
4(b)(i)	 - curly arrow from lone pair on $:\text{CN}^-$ to $\text{C}(\delta^+)$ - curly arrow from $\text{C}=\text{O}$ to $\text{O}(\delta^-)$ AND correct dipole - correct intermediate - curly arrow from lone pair on O^- to H^+			4

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Question	Answer	Marks
4(b)(ii)	hydroxynitrile	1

March 2025 9701/22 · Q4 (a), (b)(i), (b)(ii)

4(b)(iv)	M1 (also) oxidises / reacts with (primary and / or secondary) alcohol groups M2 (also) breaks the sigma and pi bond in $\text{C}=\text{C}$	2
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May/June 2025 9701/21 · Q4 (b)(iv)

3(e)	$\text{H}_2\text{C}=\text{CHCH}_2\text{CH}=\text{C}(\text{CH}_3)_2$ ✓✓  ✓✓ $\text{H}_2\text{CCHCH}_2\text{CHC}(\text{CH}_3)_2$ ✓✓ M1 $\text{H}_2\text{C}=\text{C} \dots$ on one end of their molecule OR $\dots \text{C}=\text{C}(\text{CH}_3)_2$ on one end of their molecule OR $\dots \text{C}=\text{CHCH}_2\text{CH}=\text{C} \dots$ in the middle of their molecule M2 correct structure	2
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Question	Answer	Marks
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May/June 2025 9701/22 · Q3 (e)

4(c)(ii)	hydrogen / H_2	1
4(c)(iii)	(It / Na) reduces A / B / C / the alcohol (group) OR (it / Na behaves as) reducing agent OR (it / Na) donates electrons to A / B / C / the alcohol (group)	1
4(d)(i)	$(\text{CH}_3)_3\text{COH}$	1

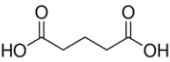
May/June 2025 9701/22 · Q4 (c)(ii), (c)(iii), (d)(i)

4(c)(iii)	propan-1-ol	1
4(d)(i)	$\text{CH}_3\text{CN} + \text{HCl} + 2\text{H}_2\text{O} \rightarrow \text{CH}_3\text{COOH} + \text{NH}_4\text{Cl}$	1

May/June 2025 9701/24 · Q4 (c)(iii), (d)(i)

1(c)(i)	Cr / $\text{Cr}_2\text{O}_7^{2-}$ AND it gains electrons	1
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Oct/Nov 2025 9701/21 · Q1 (c)(i)

3(e)(i)		1
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Oct/Nov 2025 9701/21 · Q3 (e)(i)

4(c)(i)	orange to green	1
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Oct/Nov 2025 9701/22 · Q4 (c)(i)

4(a)(iv)	M1 $\text{CH}_3\text{COCH}_3 + \text{CH}_3\text{COOH}$ as products M2 $(\text{CH}_3)_2\text{C} = \text{CHCH}_3 + 3[\text{O}] \rightarrow \text{CH}_3\text{COCH}_3 + \text{CH}_3\text{COOH}$	2
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Oct/Nov 2025 9701/24 · Q4 (a)(iv)