

1.1	$\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{O}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array}$	allow $\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{OH} \\ \quad \\ \text{H} \quad \text{H} \end{array}$	1	AO1 4.7.2.3
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1.2	hydrogen	allow H ₂	1	AO1 4.7.2.3
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1.3	oxidising (agent)	allow permanganate / dichromate ions allow [O] ignore oxygen	1	AO1 4.7.2.3
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2.1	water	allow H ₂ O allow hydrogen chloride or HCl	1	AO1 4.7.3.2
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2.2		an answer of $n \begin{array}{c} \text{CH}_3 \quad \text{H} \\ \quad \\ \text{C} = \text{C} \\ \quad \\ \text{H} \quad \text{H} \end{array} \longrightarrow \left(\begin{array}{c} \text{CH}_3 \quad \text{H} \\ \quad \\ -\text{C} - \text{C}- \\ \quad \\ \text{H} \quad \text{H} \end{array} \right)_n$ scores 3 marks		AO2 4.7.3.1
	single C–C bond and nothing added to the trailing bonds		1	
	3 × H and CH ₃ correct	must be four single bonds	1	
	n at bottom right		1	
		must be fully correct to score all 3 marks		

3.1	C=C bond in correct position		1	AO2 4.7.3.1
	3× C-H and 1× C-C bond in correct positions	do not accept any additional bonds or atoms ignore brackets and n before and after displayed structural formula an answer of $\begin{array}{c} \text{C}_6\text{H}_5 \quad \text{H} \\ \quad \\ \text{C} = \text{C} \\ \quad \\ \text{H} \quad \text{H} \end{array}$ scores 2 marks	1	

3.2	carboxylic acid (group)	allow carboxyl (group)	1	AO1 4.7.2.4
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3.3	water	allow H ₂ O	1	AO1 4.7.3.2
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4.2	(remains) orange	must be in this order allow no (colour) change	1	AO2 4.7.1.4
	(becomes) colourless	ignore initial colour ignore clear	1	

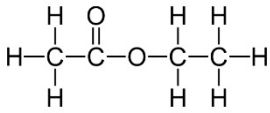
4.3	Level 2: Scientifically relevant features are identified; the way(s) in which they are similar/different is made clear and (where appropriate) the magnitude of the similarity/difference is noted.	4–6	AO1 AO2
	Level 1: Relevant features are identified and differences noted.	1–3	
	No relevant content	0	4.7.1.1 4.7.1.3 4.7.1.4 4.7.2.1 4.7.2.2 4.9.3.1
	Indicative content Structure and bonding • both are hydrocarbons • both contain two carbon atoms (per molecule) • ethane contains six hydrogen atoms (per molecule) • (but) ethene contains four hydrogen atoms (per molecule) • both have covalent bonds • ethane contains a single C—C bond • (but) ethene contains a double bond • both contain C—H bonds • both small molecules Reactions • both react with oxygen in complete combustion reactions • to produce water and carbon dioxide • both react with oxygen in incomplete combustion reactions • to produce water, carbon monoxide and carbon • incomplete combustion is more likely with ethene • ethene decolourises bromine water • (but) ethane does not decolourise bromine water • ethene is more reactive (than ethane) • ethene can react with hydrogen (to produce ethane) • ethene can react with water (to produce ethanol) • ethene can react with halogens (to produce halogenoalkanes) • ethene can undergo addition reactions • ethene can polymerise (to produce poly(ethene)) ignore physical properties ignore references to flammability		

5.1	HCOOH propanoic acid	allow HCO ₂ H	1 1	AO1 4.7.2.4
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5.2	incomplete / partial ionisation	allow incomplete / partial dissociation	1	AO3 4.7.2.4
	(because) reaction is reversible	allow (because) reaction is in equilibrium	1	

5.3	mass (of flask and contents) decreases		1	AO1
	(because) carbon dioxide is produced	}	1	AO2
	(and) carbon dioxide escapes (from the flask)		1	AO2
				4.3.1.3 4.7.2.4

5.4	ethyl ethanoate		1	AO1 4.7.2.4
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5.5		1	AO2 4.7.2.4 4.7.3.2
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6.1	starch	allow glycogen	1	AO1 4.7.3.4
	cellulose		1	

6.2	2		1	AO1 4.7.3.3
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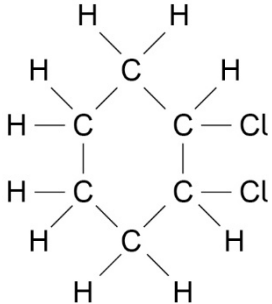
6.3	water	allow H ₂ O	1	AO1 4.7.3.3
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6.4	two polymer chains	allow two polymer strands	1	AO1 4.7.3.4
	four (different) monomers / nucleotides	allow four (different) bases allow cytosine, guanine, adenine and thymine allow C G A T	1	
	(double) helix	allow spiral if no other mark awarded, allow 1 mark for DNA	1	

7.1	$n \begin{array}{c} \text{H} & \text{H} \\ & \\ \text{C} = & \text{C} \\ & \\ \text{H} & \text{H} \end{array} \longrightarrow \left(\begin{array}{c} \text{H} & \text{H} \\ & \\ -\text{C} - & \text{C}- \\ & \\ \text{H} & \text{H} \end{array} \right)_n$		2	AO1 4.7.3.1
		if equation incorrect allow 1 mark for 5 single bonds or allow 1 mark for n		

7.2	circle around HO– or –OH on monomer A		1	AO2 4.7.2.3 4.7.3.2
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8.1	(test) (add) bromine (water)		1	AO1 4.7.1.4 4.7.2.2
	(result) (changes from) brown / orange to colourless	ignore clear	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
8.2		allow 1 mark for the structure of 1, 1-dichlorocyclohexane or 1, 3-dichlorocyclohexane or 1, 4-dichlorocyclohexane	2	AO2 4.7.2.2

9.1	$\text{C}_4\text{H}_9\text{OH} + 6 \text{O}_2 \rightarrow 4 \text{CO}_2 + 5 \text{H}_2\text{O}$	allow $\text{C}_4\text{H}_{10}\text{O}$ for $\text{C}_4\text{H}_9\text{OH}$ allow multiples allow 1 mark for $\text{C}_4\text{H}_9\text{OH} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$ with incorrect / no multipliers ignore state symbols	2	AO2 4.1.1.1 4.3.1.1 4.7.2.3
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10.1	C=C bond 2x C-H bonds and 2x C-CH₃ bonds	do not accept extra bonds an answer of $\begin{array}{cc} \text{CH}_3 & \text{CH}_3 \\ & \\ \text{C} & = & \text{C} \\ & \\ \text{H} & \text{H} \end{array}$ scores 2 marks	1 1	AO2 4.7.3.1
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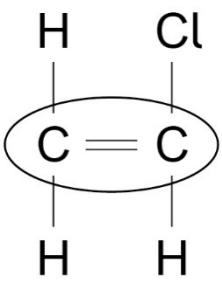
11.1	C_7H_{14} and C_8H_{16}		1	AO2 4.7.1.4 4.7.2.1
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12.1	(the acid is only) partially ionised (in aqueous solution)		1	AO1 4.4.2.6
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13.1	an oxidising agent		1	AO1 4.7.2.3
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Question	Answers	Extra information	Mark	AO / Spec. Ref.
13.2	$\begin{array}{c} \text{--- C} = \text{O} \\ \\ \text{O} \text{--- H} \end{array}$		1	AO1 4.7.2.4

Question	Answers	Mark	AO / Spec. Ref.														
13.3	<table><tr><th>Compound</th><th>Product of the reaction with ethanoic acid</th></tr><tr><td>Ethanol</td><td>Carbon dioxide</td></tr><tr><td></td><td>Ethene</td></tr><tr><td></td><td>Ethyl ethanoate</td></tr><tr><td>Sodium carbonate</td><td>Hydrogen</td></tr><tr><td></td><td>Poly(ethene)</td></tr></table> do not accept more than one line from a box on the left	Compound	Product of the reaction with ethanoic acid	Ethanol	Carbon dioxide		Ethene		Ethyl ethanoate	Sodium carbonate	Hydrogen		Poly(ethene)	<table><tr><td>1</td></tr><tr><td>1</td></tr></table>	1	1	AO1 4.7.2.4
Compound	Product of the reaction with ethanoic acid																
Ethanol	Carbon dioxide																
	Ethene																
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Sodium carbonate	Hydrogen																
	Poly(ethene)																
1																	
1																	

14.1	 The diagram shows the chemical structure of chloroethene (vinyl chloride). It consists of two carbon atoms connected by a double bond (C=C). The left carbon is bonded to two hydrogen atoms (H), one above and one below. The right carbon is bonded to a hydrogen atom (H) below and a chlorine atom (Cl) above. A horizontal oval is drawn around the C=C double bond.		1	AO1 4.7.3.1
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Question	Answers	Extra information	Mark	AO / Spec. Ref.
14.2	C-C bond 3x C-H and 1x C-Cl bonds 2x single bonds extending through brackets and n below halfway	 an answer of $\left(\begin{array}{cc} \text{H} & \text{Cl} \\ & \\ -\text{C} & -\text{C}- \\ & \\ \text{H} & \text{H} \end{array} \right)_n$ scores 3 marks	1 1 1	AO2 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
14.3	water	allow H ₂ O	1	AO1 4.7.3.3

14.4	The diagram shows a branched polysaccharide structure consisting of three glucose units. Each glucose unit is represented as a six-membered ring with an oxygen atom at the top vertex. The units are linked by α-1,4 glycosidic bonds. The central glucose unit is circled. The left and right units are also linked to the central unit via α-1,4 glycosidic bonds. The structure includes labels for CH₂OH, H, C, O, OH, and H atoms.	1	AO2 4.7.3.1 4.9.1.3
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Question	Answers	Extra information	Mark	AO / Spec. Ref.
14.5	starch	allow cellulose allow glycogen allow polysaccharide	1	AO3 4.7.3.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
14.6	nucleotides		1	AO1 4.7.3.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
14.7	double helix	ignore DNA	1	AO1 4.7.3.4