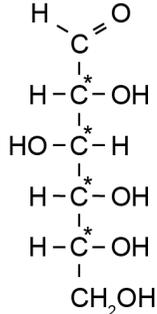
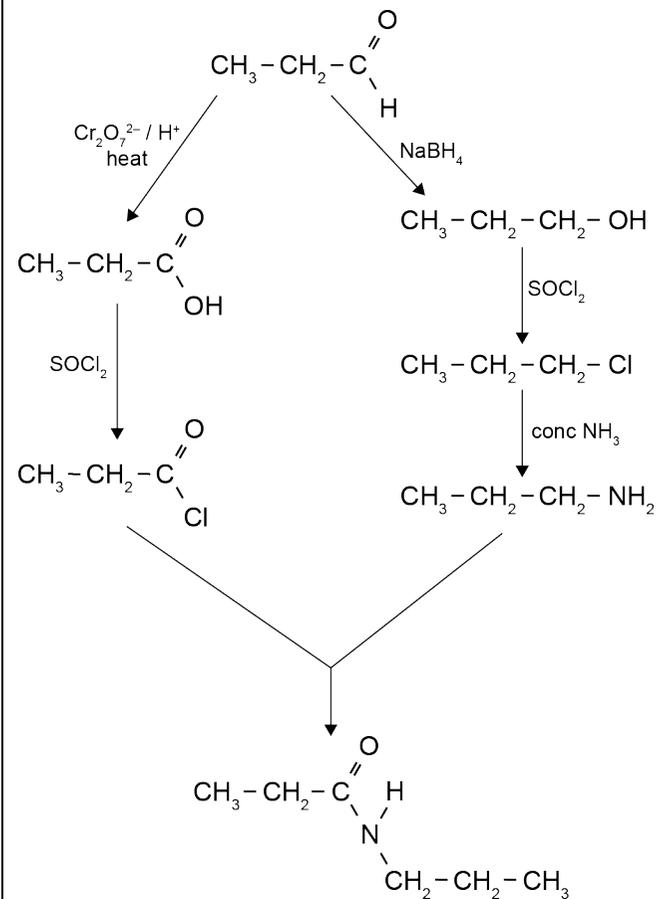


Assessment Schedule – 2025**Chemistry: Demonstrate understanding of the properties of organic compounds (91391)****Evidence Statement**

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)(i)	 <p data-bbox="241 783 1032 842">(ii) The enantiomers can be distinguished because they rotate plane polarised light in opposite directions.</p> <p data-bbox="241 882 1032 1002">(iii) D-glucose contains an aldehyde group. When heated with Tollens' reagent, the aldehyde group undergoes an oxidation reaction to form a carboxylic acid, and the silver ions in the Tollens' reagent are reduced to silver atoms to form a silver mirror.</p>	<ul data-bbox="1070 675 1352 730" style="list-style-type: none"> • ALL FOUR asymmetric carbon atoms identified. OR Recognises the enantiomers rotate plane polarised light.	<ul data-bbox="1447 651 1816 735" style="list-style-type: none"> • Explains the enantiomers rotate plane-polarised light in opposite directions. OR Explains that the aldehyde group undergoes an oxidation reaction to form a carboxylic acid as the silver ions are reduced.	

(b)



• At least TWO steps correct.

• At least FOUR steps correct.

• ALL correct.

(c)(i)	The colour change would be purple to colourless. This is a result of the acidified potassium permanganate solution oxidising the butan-1-ol.	• Correct colour change and reaction type.		
(ii)	Since the butan-1-ol was oxidised using heat under reflux, it was oxidised through to butanoic acid rather than just butanal. Butanoic acid has a higher boiling point than butanal, so it will not be collected at 73–76 °C.	• Recognises the butan-1-ol would have oxidised to butanoic acid.	• Explains why no fraction is collected at 73–76 °C or states that the butanoic acids BP is much higher than 76 °C / states BP of butanoic acid 163 °C.	
(iii)	If the butan-1-ol had been oxidised using distillation, the butanal initially produced from the oxidation of butan-1-ol would have vaporised (due to low boiling point). The butanal vapour would rise up and enter the condenser. Once inside the condenser, the vapour would cool to form liquid butanal and be removed from the reaction mixture so that it cannot further oxidise to butanoic acid. Since the condenser is not arranged vertically like when using heat under reflux, the butanal cannot drop back into the reaction mixture once it has been cooled in the condenser and can therefore be purified from the reaction mixture. Using heat under reflux, the vertical position of the condenser means the cooled butanal will drop back into the reaction mixture and undergo further oxidation to form butanoic acid.	• Recognises distillation removes the butanal from the reaction mixture.	• Explain how the process of distillation purifies / separates the butanal. OR Position of the condenser.	• Outlines why butan-1-ol must be oxidised using distillation to obtain butanal as the product, including reference to the process of distillation and the position of the condenser.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	1a	2a	3a	4a	3m	4m	2e with minor error / omission in one part.	2e

(b)(i)	<table border="1"> <thead> <tr> <th data-bbox="264 169 353 268">Step</th> <th data-bbox="353 169 544 268">Observations</th> <th data-bbox="544 169 734 268">Type of reaction occurring</th> <th data-bbox="734 169 963 268">Name of Organic Compound identified</th> </tr> </thead> <tbody> <tr> <td data-bbox="264 268 353 387">1</td> <td data-bbox="353 268 544 387">Steamy fumes released</td> <td data-bbox="544 268 734 387">Substitution</td> <td data-bbox="734 268 963 387">Ethanoyl chloride</td> </tr> <tr> <td data-bbox="264 387 353 499">2</td> <td data-bbox="353 387 544 499">Blue solution forms orange-red solid</td> <td data-bbox="544 387 734 499">Oxidation</td> <td data-bbox="734 387 963 499">Ethanal</td> </tr> <tr> <td data-bbox="264 499 353 611">3</td> <td data-bbox="353 499 544 611">Orange solution turns green / blue</td> <td data-bbox="544 499 734 611">Oxidation</td> <td data-bbox="734 499 963 611">Ethanol</td> </tr> </tbody> </table>	Step	Observations	Type of reaction occurring	Name of Organic Compound identified	1	Steamy fumes released	Substitution	Ethanoyl chloride	2	Blue solution forms orange-red solid	Oxidation	Ethanal	3	Orange solution turns green / blue	Oxidation	Ethanol	<ul style="list-style-type: none"> • ONE row or column correct. 	<ul style="list-style-type: none"> • TWO rows correct. 	
Step	Observations	Type of reaction occurring	Name of Organic Compound identified																	
1	Steamy fumes released	Substitution	Ethanoyl chloride																	
2	Blue solution forms orange-red solid	Oxidation	Ethanal																	
3	Orange solution turns green / blue	Oxidation	Ethanol																	
(ii)	<ul style="list-style-type: none"> • Addition of water needs to be the first step to eliminate the ethanoyl chloride. • If potassium dichromate / Fehling's added first the water in the solution would react with ethanoyl chloride. • If potassium dichromate / Fehling's were added first, then ethanol and / or ethanal would also react. • If potassium dichromate added at step 2 / after ethanoyl chloride eliminated, two solutions react. • If Fehling's added second only ethanal reacts. • Potassium dichromate is a stronger oxidising agent than Fehling's. • Last step add potassium dichromate to positively identify ethanol. 	<ul style="list-style-type: none"> • ONE bullet point correct. 	THREE bullet points correct.	<ul style="list-style-type: none"> • FIVE bullet points correct. 																

(c)	A	$\begin{array}{c} \text{CH}_2=\text{CH}-\text{CH}-\text{CH}_3 \\ \\ \text{OH} \end{array}$	<ul style="list-style-type: none"> Identifies ONE correct functional groups for A, D, and E. TWO correct structural formulae. 	<ul style="list-style-type: none"> THREE correct structural formulae. 	<ul style="list-style-type: none"> All correct.
	B	$\begin{array}{c} \text{CH}_3-\text{CH}-\text{CH}-\text{CH}_3 \\ \quad \\ \text{OH} \quad \text{OH} \end{array}$			
	C	$\begin{array}{c} \text{CH}_2-\text{CH}_2-\text{CH}-\text{CH}_3 \\ \quad \quad \\ \text{OH} \quad \quad \text{OH} \end{array}$			
	D	$\begin{array}{c} \text{CH}_3-\text{CH}-\text{CH}-\text{CH}_3 \\ \quad \\ \text{NH}_2 \quad \text{NH}_2 \end{array}$			
	E	$\begin{array}{c} \text{O} \quad \quad \quad \text{O} \\ \quad \quad \quad \\ \text{HO}-\text{C}-\text{CH}_2-\text{C}-\text{CH}_3 \\ \\ \text{HO} \end{array}$			

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	1a	2a	3a	4a	3m	4m	2e, with minor error / omission in one part.	2e

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
<p>THREE</p> <p>(a)(i)</p> <p>(ii)</p> <p>(iii)</p> <p>(iv)</p>	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> $\begin{array}{ccccccc} & \text{H} & \text{O} & \text{H} & \text{H} & & \\ & & & & & & \\ \text{H}_2\text{N} & -\text{C} & -\text{C} & -\text{N} & -\text{C} & -\text{C} & \\ & & & & & // & \\ & \text{CH}_2\text{SH} & & \text{H} & & \text{O} & \\ & & & & & \backslash & \\ & & & & & & \text{OH} \end{array}$ </div> <div style="text-align: center;"> $\begin{array}{ccccccc} & \text{H} & \text{O} & \text{H} & \text{H} & & \\ & & & & & & \\ \text{H}_2\text{N} & -\text{C} & -\text{C} & -\text{N} & -\text{C} & -\text{C} & \\ & & & & & // & \\ & \text{H} & & & & \text{O} & \\ & & & & & \backslash & \\ & & & & & & \text{OH} \end{array}$ </div> </div> <p>This is a condensation reaction because two small amino acids have joined together to form a larger dipeptide, with a water molecule released as the amide (peptide) linkage forms.</p> <p>One ester group circled.</p> <p>When Dacron is heated with NaOH solution, a hydrolysis reaction occurs.</p> <ul style="list-style-type: none"> Water is used to break the ester linkages. The C–O from each ester linkage gains an –H from water to form an alcohol group. The C=O from each ester linkage gains an –OH from water to form a carboxylic acid group. As the hydrolysis is occurring in basic condition –COOH donates a proton to the OH[–] in solution / –COOH deprotonates / acid -base reaction occurs to form the salt, –COONa. <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> $\begin{array}{c} \text{O} & & \text{O} \\ & & \\ \text{NaO}-\text{C} & -\text{C}_6\text{H}_4 & -\text{C}-\text{ONa} \\ & & \\ & & \text{O} & & \text{O} \\ & & & & \\ & & \text{HO}-\text{CH}_2 & - & \text{CH}_2-\text{OH} \end{array}$ </div> </div> <p><i>Accept</i> $-\text{C}(=\text{O})\text{O}^-$</p>	<ul style="list-style-type: none"> Draws an amide (peptide) linkage in one dipeptide and identifies reaction as condensation. Circles ester linkage and identifies reaction as hydrolysis in (iv). Breaks ester linkage correctly to form two correct organic products. 	<ul style="list-style-type: none"> Explains the condensation reaction to form a dipeptide, including the structural formula for one dipeptide. <p>THREE correct bullet points.</p> <p>AND</p> <p>TWO correct organic products.</p>	<p>=</p> <ul style="list-style-type: none"> Parts (i), (ii), and (iv) correct. <p>AND</p> <p>FOUR correct bullet points.</p> <p>AND</p> <p>TWO correct organic products.</p>

<p>(b)(i)</p> <p>(ii)</p> <p>(iii)</p>	<p>Compound Y</p> <p>Both Compounds W and Y exist as <i>cis-trans</i> isomers because they each have a carbon-carbon double bond with two different groups bonded to each of these C atoms. Compound X cannot exist as <i>cis-trans</i> isomers because one of the C atoms in its C=C has two H atoms attached.</p> <p>Both Compounds X and Y have a carboxylic acid group that undergoes a substitution reaction upon the addition of thionyl chloride to produce steamy fumes (of gaseous HCl). Compound W does not react with thionyl chloride.</p> <p>Both Compounds W and Y can be reduced by sodium borohydride. In W, the aldehyde group can be reduced, and the ketone group can be reduced in Y. Compound X does not have a functional group that can be reduced by NaHB₄.</p> <p>Compound Y is the only compound that has all three properties.</p> <p> $\begin{array}{ccccccc} & & & & \text{O} & & \\ & & & & // & & \\ \text{CH}_3 & - & \text{CH} & - & \text{CH}_2 & - & \text{CH}_2 & - & \text{C} & \\ & & & & & & & & \backslash & \\ & & \text{OH} & & & & & & \text{OH} & \end{array}$ </p> <p> $\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_2 = \text{C} - \text{CH} - \text{CH}_3 \\ \\ \text{Br} \end{array}$ </p>	<ul style="list-style-type: none"> Recognises at least one property for two of the compounds. Draws a carboxylic acid group. OR Draws an alcohol group. Draws a branched chain. OR Draws a C=C bond. 	<ul style="list-style-type: none"> Chooses Compound Y with support from at least two properties. Draws a structure with a secondary alcohol group and a carboxylic acid group. Draws a structure with a branched chain and a C=C bond and an asymmetric carbon atom. 	<ul style="list-style-type: none"> Any TWO of: <ul style="list-style-type: none"> Explains why Compound Y is the correct compound with support from all three properties, and explains why at least one of the other compounds is eliminated. Draws the correct structural formula of Compound S. Draws the correct structural formula of Compound T.
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NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	1a	2a	3a	4a	3m	4m	2e with minor error / omission in one part.	2e

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 13	14 – 18	19 – 24