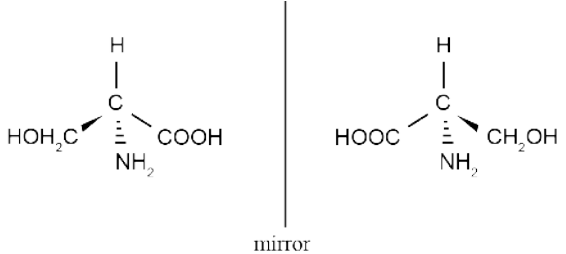
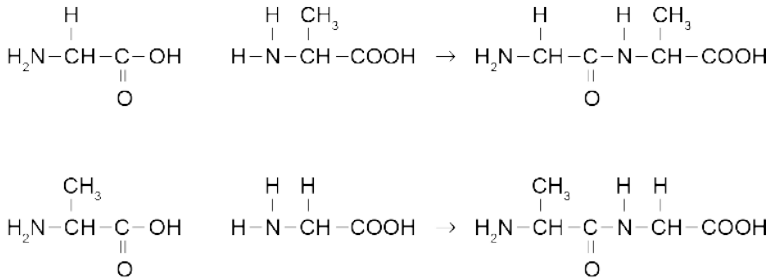


Assessment Schedule – 2016**Chemistry: Demonstrate understanding of the properties of organic compounds (91391)****Evidence Statement**

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)	$\begin{array}{c} \text{O} \\ \parallel \\ \text{CH}_3 - \text{C} \\ \backslash \\ \text{O} - \text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3 \end{array}$ <p>butylethanoate</p> $\begin{array}{c} \text{OH} \\ \\ \text{CH}_3\text{CH}_2 - \text{CH} - \text{C} \\ \parallel \\ \text{H} \end{array}$ <p>2-hydroxybutanal</p> $\begin{array}{c} \text{O} \\ \parallel \\ \text{CH}_3 - \text{C} \\ \backslash \\ \text{NH}_2 \end{array}$ <p>ethanamide</p>	<ul style="list-style-type: none"> Two correct. 		
(b)	<ol style="list-style-type: none"> Hydroxyl (alcohol). Amine / amino. Amide / peptide. Carboxylic acid. 	<ul style="list-style-type: none"> Three correct. 		

<p>(c)(i)</p>  <p>(ii) Glycine. It does NOT have a chiral C, i.e. it needs four different groups around the central C atom, glycine only has three.</p> <p>(iii) Dipeptides:</p>  <p>(iv) Condensation. Two larger molecules are joined together with the elimination of a smaller molecule.</p> <p>(v) Acidic hydrolysis leaves COOH group intact and NH₂ group becomes protonated to form NH₃⁺. H₃N⁺CH(CH₃)COOH H₃N⁺CH₂COOH</p>	<ul style="list-style-type: none"> • Attempts to draw two 3-D structures but with careless error OR ONE correct 3-D structure. • Glycine plus one relevant statement. • Correct peptide linkage shown, but the structure is incorrect. • Correct reaction type OR explanation. • Recognises COOH forms, but incorrect structure OR Recognises NH₃⁺ formed. 	<ul style="list-style-type: none"> • TWO correct 3-D images. • Glycine plus explanation of chiral / asymmetric carbon. • One correct dipeptide. • Correct reaction type AND explanation. • Correct structure for one amino acid AND a partial explanation OR Correct hydrolysis products given. 	<ul style="list-style-type: none"> • Both dipeptides are correctly shown. • Correct hydrolysis products given, with explanation. 					
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence	1a	2a	4a	6a	3m	4m	1e + 3m	2e

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
TWO (a)(i) (ii)	Sodium borohydride / NaBH ₄ (accept LiAlH ₄) Pentanal will produce a primary alcohol / pentan-1-ol. CH ₃ CH ₂ CH ₂ CH ₂ CH ₂ OH Pentan-2-one will produce a secondary alcohol / pentan-2-ol. $\begin{array}{c} \text{CH}_3\text{CH}_2\text{CH}_2\text{CHCH}_3 \\ \\ \text{OH} \end{array}$	<ul style="list-style-type: none"> • Correct name or formula of reagent. • EITHER one correct classification OR one correct structure. 	<ul style="list-style-type: none"> • Correct name or formula of reagent. AND Both alcohols classified. AND Both structures are correct. 	

<p>(b)(i)</p> <p>(ii)</p>	<p>A: Propan-1-amine. (1-propanamine) B: Propanal. C: Propanoyl chloride. D: Propan-2-one. (propanone)</p> <p>A: <i>Propan-1-amine (a primary amine)</i> $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$ (propan-1-amine) will turn moist red litmus paper blue as it is basic. $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2 + \text{H}_2\text{O} \rightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_3^+ + \text{OH}^-$ Water: Dissolves in water. Benedict's solution will stay blue as primary amines do not react with Benedict's reagent.</p> <p>B: <i>Propanal (An aldehyde)</i> Damp Litmus: No colour change. Water: Dissolves in water. Propanal will react with Benedict's reagent, with the blue solution forming a (copper mirror) / brick red precipitate. Propanoic acid is formed. $\text{CH}_3\text{CH}_2\text{CHO} \rightarrow \text{CH}_3\text{CH}_2\text{COOH}$</p> <p>C: <i>Propanoyl chloride (An acyl chloride)</i> Damp Litmus: Turn blue litmus red Water: Propanoyl chloride will react vigorously with water to produce propanoic acid and hydrogen chloride. $\text{CH}_3\text{CH}_2\text{COCl} + \text{H}_2\text{O} \rightarrow \text{CH}_3\text{CH}_2\text{COOH} + \text{HCl}$ Benedict's solution will stay blue as the acyl chloride does not react with the Benedict's, but instead reacts with the water present in the Benedict's solution.</p> <p>D: <i>Propan-2-one (A ketone)</i> CH_3COCH_3 (propan-2-one) Damp Litmus: No colour change. Water: Dissolves in water. Benedict's solution: No reaction, so stays blue.</p>	<ul style="list-style-type: none"> • THREE correct names. • Correct reagent chosen for two substances with incomplete observations. OR ONE substance correctly identified with equation. 	<ul style="list-style-type: none"> • TWO substances from A, B and C correctly identified with accurate observations. • TWO correct equations. OR All FOUR substances are correctly identified, with accurate observations and ONE correct equation. 	<ul style="list-style-type: none"> • All chemicals are correctly identified with accurate observations. <p>AND</p> <p>TWO appropriate symbol equations given.</p>
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NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence	1a	2a	3a	4a	2m	3m	1e with minor error / omission	1e

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
THREE (a)	Structures: S1: CH ₃ COOCH ₂ CH ₂ CH ₃ S2: CH ₃ CH ₂ CH ₂ OH S3: CH ₃ CH=CH ₂ S4: CH ₃ CH ₂ CH ₂ Cl S5: CH ₃ CH(Cl)CH ₃ S6: CH ₃ COCl S7: CH ₃ CONHCH ₂ CH ₂ CH ₃ Reagent 1 = H ₂ O / H ⁺ (dilute acid) Reagent 2 = conc. H ⁺ (H ₂ SO ₄ or H ₃ PO ₄) Reagent 3 = NH ₃ (<i>alc</i>) or conc.	<ul style="list-style-type: none"> Any THREE correct structures. Any ONE fully correct reagent. 	<ul style="list-style-type: none"> At least SEVEN correct including ONE fully correct reagent. 	<ul style="list-style-type: none"> All structures and reagents correct.
(b)	<p>Step 1: Butan-1-ol to but-1-ene. Dehydration reaction (elimination reaction) using conc H₂SO₄. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH} \xrightarrow{\text{conc H}_2\text{SO}_4} \text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$</p> <p>Step 2: But-1-ene to butan-2-ol. Hydration reaction (addition reaction) using dil. H₂SO₄ (H⁺/H₂O) $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2 \xrightarrow{\text{dil H}_2\text{SO}_4} \text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$ Major product</p> <p>Step 3: Butan-2-ol (Major product) to butan-2-one. Oxidation reaction of secondary alcohol to form a ketone using Cr₂O₇²⁻ / H⁺ under reflux. $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_3 \xrightarrow{\text{Cr}_2\text{O}_7^{2-} / \text{H}^+} \text{CH}_3\text{CH}_2\text{COCH}_3$</p> <p>Other workable schemes are possible.</p>	<ul style="list-style-type: none"> ONE correct reagent. ONE correct conversion step. 	<ul style="list-style-type: none"> Workable scheme, with at least one fully correct reagent. 	<ul style="list-style-type: none"> All correct with full understanding.

<p>(c)(i)</p>	<p>One of these groups circled:</p> $\begin{array}{c} \text{CH}_2-\text{OOC}-(\text{CH}_2)_7-\text{CH}=\text{CH}-(\text{CH}_2)_7-\text{CH}_3 \\ \\ \text{CH}-\text{OOC}-(\text{CH}_2)_7-\text{CH}=\text{CH}-(\text{CH}_2)_7-\text{CH}_3 \\ \\ \text{CH}_2-\text{OOC}-(\text{CH}_2)_{14}-\text{CH}_3 \end{array}$	<ul style="list-style-type: none"> Ester functional group indicated. 		
<p>(ii)</p>	$\begin{array}{c} \text{CH}_2\text{OH} \\ \\ \text{CHOH} \\ \\ \text{CH}_2\text{OH} \end{array}$ <p>NaOOC-(CH₂)₇-CH=CH-(CH₂)₇-CH₃ and NaOOC-(CH₂)₁₄-CH₃</p>	<ul style="list-style-type: none"> ONE correct product for hydrolysis reaction. 	<ul style="list-style-type: none"> All THREE products correct. 	

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence	1a	2a	4a	5a	2m	3m OR 2e BOTH with minor error / omission	2e ONE with a minor error / omission	2e

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 13	14 – 19	20 – 24