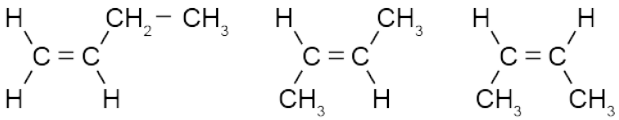


Assessment Schedule – 2014**Chemistry: Demonstrate understanding of the properties of organic compounds (91391)****Evidence Statement**

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)	3-chlorobutanone $\text{CH}_3 - \text{CH}_2 - \text{CO} - \text{NH}_2$ methylbutanoate	<ul style="list-style-type: none"> • TWO correct. 		
(b)(i)	 <p>in lowest concentration</p>	<ul style="list-style-type: none"> • Two isomers. 	<ul style="list-style-type: none"> • All three isomers. <p>OR</p> <p>Two isomers and correct choice with partial explanation.</p>	<ul style="list-style-type: none"> • All three isomers. <p>AND</p> <p>Correct choice with explanation.</p>
(ii)	<p>The minor product is but-1-ene.</p> <p>Saytzeff's rule: the minor product will have the least substituted double bond OR</p> <p>Saytzeff's rule is explained.</p> <p>Eg: the minor product is formed by the removal of the OH group and a hydrogen atom is removed from the carbon adjacent to the C-OH that has the most hydrogens.</p>			

<p>(c)(i)</p> <p>(ii)</p>	<p>Ester group:</p> $ \begin{array}{c} \text{O} \\ \\ -\text{O}-\text{C}- \end{array} $ $ \begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{OH} \quad \text{OH} \quad \text{OH} \\ \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{OH} \quad \text{OH} \quad \text{OH} \end{array} + 3\text{CH}_3(\text{CH}_2)_{16}\text{COONa} $ $ \begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{OH} \quad \text{OH} \quad \text{OH} \end{array} + 3\text{CH}_3(\text{CH}_2)_{16}\text{COOH} $ <p>Both acidic and basic hydrolysis produce the same alcohol <i>propan-1,2,3-triol</i>.</p> <p>In addition, they both require heat / reflux</p> <p>In contrast, acidic hydrolysis requires $\text{H}_2\text{O} / \text{H}^+$ or $\text{HCl}(aq)$ and produces the carboxylic acid, whereas basic hydrolysis requires $\text{H}_2\text{O} / \text{OH}^-$ or $\text{NaOH}(aq)$ and produces the carboxylate ion/salt.</p>	<ul style="list-style-type: none"> • Correct functional group circled AND named. • One correct structure. OR Partial discussion. 	<ul style="list-style-type: none"> • Two unique products linked to the type of hydrolysis. OR Products of one reaction correctly linked to the type of hydrolysis and reagent or conditions. 	<ul style="list-style-type: none"> • Comparison and contrast of hydrolysis to give salt / acid and alcohol. Reagents with conditions and structures correct.
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NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response or no relevant evidence.	1a	2a	3a	4a	1m & 3a	2m	2e with minor error or omission, or have not compared and contrasted.	2e

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
TWO (a)(i)	<i>Damp red</i> litmus. Propanamine will change the colour of <i>red</i> litmus blue. Propanamide will not change the colour of <i>red</i> litmus.	<ul style="list-style-type: none"> Two correct reagents. Correct observation for ONE compound. 	<ul style="list-style-type: none"> TWO pairs of compounds distinguished with reagents and observations linked to the relevant species. 	<ul style="list-style-type: none"> ALL pairs of compounds distinguished with reagents, conditions and observations linked to species.
(ii)	Tollens' reagent (Fehling's or Benedict's or $\text{Cr}_2\text{O}_7^{2-} / \text{H}^+$ or $\text{MnO}_4^- / \text{H}^+$). Propanal will form a silver mirror when <u>warmed</u> with Tollens' reagent. Propanone will not react with Tollens' reagent.			
(iii)	Water. Propanoyl chloride will react violently with water. Propyl propanoate will not react with water / it will form layers.			
(b)(i)	Gas = Carbon dioxide / CO_2 NaHCO_3 is used to remove any remaining acid <i>mixed with the liquid product</i> .	<ul style="list-style-type: none"> (i) OR (ii) correct. (iii) is correct. Correct purpose. OR Partial explanation. 	<ul style="list-style-type: none"> All correct from (i) – (iii). Correct purpose. AND Partially explained. 	<ul style="list-style-type: none"> Comprehensive discussion.
(ii)	Na_2SO_4 is added to remove any remaining water <i>mixed with the liquid product</i> .			
(iii)	Fractional Distillation. Equipment 1.			
(iv)	The purpose of the process is to purify the chemical / remove impurities / separate product <ul style="list-style-type: none"> This is achieved by separating liquids according to their boiling points. Chemicals are boiled then condensed / liquid-gas then gas-liquid. The fraction at the desired boiling point is kept / other fractions are discarded. 			

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response or no relevant evidence.	1a	2a	3a	4a	2m	3m	2e with minor error or omission, such as a missing condition.	2e

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
THREE (a)	<p>A = Propan-2-ol $\begin{array}{c} \text{OH} \\ \\ \text{CH}_3\text{CHCH}_3 \end{array}$</p> <p>B = Propan-1-ol $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$</p> <p>C = Propanone $\begin{array}{c} \text{O} \\ \\ \text{CH}_3\text{CCH}_3 \end{array}$</p> <p>D = Propanoic acid $\text{CH}_3\text{CH}_2\text{COOH}$</p> <p>E = Propanoyl chloride $\begin{array}{c} \text{O} \\ \\ \text{CH}_3\text{CH}_2\text{CCl} \end{array}$</p> <p>F = Propanamide $\begin{array}{c} \text{O} \\ // \\ \text{CH}_3\text{CH}_2\text{C} \\ \backslash \\ \text{NH}_2 \end{array}$</p> <p>G = Propyl propanoate $\text{CH}_3\text{CH}_2\text{C}(=\text{O})\text{OCH}_2\text{CH}_2\text{CH}_3$</p> <p>H = Methyl ethyl propanoate (not required) $\text{CH}_3\text{CH}_2 - \text{C}(=\text{O}) - \text{O} - \text{CH}(\text{CH}_3)\text{CH}_3$</p>	<ul style="list-style-type: none"> • FIVE correct structures. • FIVE correct names. 	<ul style="list-style-type: none"> • ELEVEN structures or names correct. 	<ul style="list-style-type: none"> • FOURTEEN structures or names correct. <p><i>(Penalise once for -HO / -H₂N.)</i></p>

(b)	$\begin{array}{c} \text{CH}_3\text{CHCOOH} \\ \\ \text{NH}_2 \end{array}$ <p>Acid hydrolysis conditions: $\text{H}_2\text{O}/\text{H}^+$ or $\text{HCl}(\text{aq})$ and heat or reflux</p> $\begin{array}{c} \text{CH}_3 \quad \text{O} \\ \quad \parallel \\ \text{H}_3\text{N}^+ - \text{CH} - \text{C} - \text{OH} \end{array}$ <p>Basic hydrolysis conditions: $\text{H}_2\text{O}/\text{OH}^-$ or $\text{NaOH}(\text{aq})$ and heat or reflux</p> $\begin{array}{c} \text{CH}_3 \quad \text{O} \\ \quad \parallel \\ \text{H}_2\text{N} - \text{CH} - \text{C} - \text{ONa} \end{array}$	<ul style="list-style-type: none"> • Monomer structure contains amine or carboxylic acid or acyl chloride. • Acidic hydrolysis conditions. OR Basic hydrolysis conditions. OR ONE Structure correct. 	<ul style="list-style-type: none"> • Correct monomer structure. • One product of hydrolysis linked to type of hydrolysis and condition. OR Two structures. 	<ul style="list-style-type: none"> • Both hydrolysis products and conditions.
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NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response or no relevant evidence.	Part statement for Achievement (three boxes from (a))	1a	2a	3a	2m	3m	2e with minor error or omission. Eg: omitting H_2O and heat	2e

Cut Scores

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