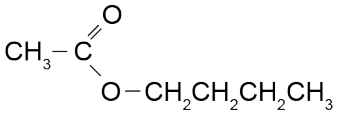
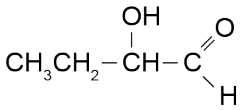
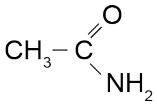
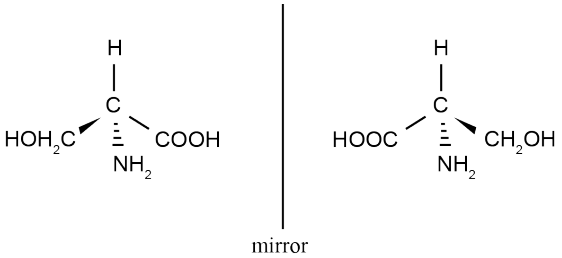
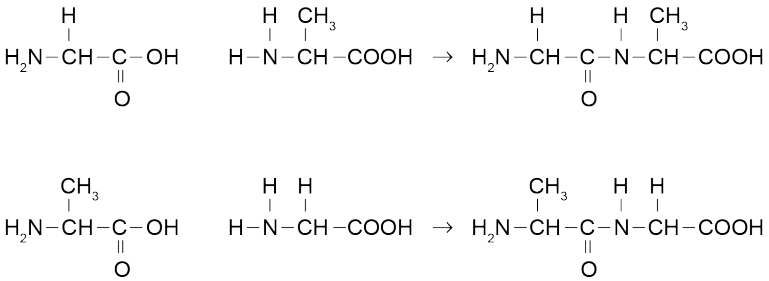
Assessment Schedule – 2016

Chemistry: Demonstrate understanding of the properties of organic compounds (91391)

Evidence Statement

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)	 butylethanoate  2-hydroxybutanal  ethanamide	• Two correct.		
(b)	1. Hydroxyl (alcohol). 2. Amine / amino. 3. Amide / peptide. 4. Carboxylic acid.	• Three correct.		

(c)(i)		• Attempts to draw two 3-D structures but with careless error OR ONE correct 3-D structure.	• TWO correct 3-D images.	
(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.	• Glycine plus one relevant statement.	• Glycine plus explanation of chiral / asymmetric carbon.	
(iii)	Dipeptides: 	• Correct peptide linkage shown, but the structure is incorrect.	• One correct dipeptide.	• Both dipeptides are correctly shown.
(iv)	Condensation. Two larger molecules are joined together with the elimination of a smaller molecule.	• Correct reaction type OR explanation.	• Correct reaction type AND explanation.	
(v)	Acidic hydrolysis leaves COOH group intact and NH_2 group becomes protonated to form NH_3^+. $H_3N^+CH(CH_3)COOH$ $H_3N^+CH_2COOH$	• Recognises COOH forms, but incorrect structure OR Recognises NH_3^+ formed.	• Correct structure for one amino acid AND a partial explanation OR Correct hydrolysis products given.	• Correct hydrolysis products given, with explanation.

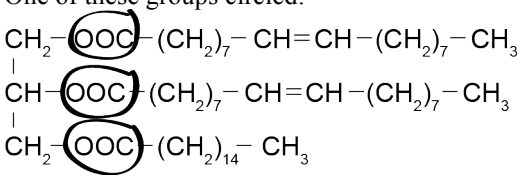
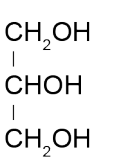
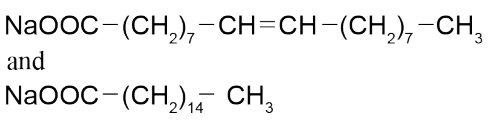
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence	1a	2a	4a	6a	3m	4m	1e + 3m	2e

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
TWO (a)(i)	Sodium borohydride / $NaBH_4$ (accept $LiAlH_4$)	• Correct name or formula of reagent.	• Correct name or formula of reagent. AND Both alcohols classified. AND Both structures are correct.	
(ii)	Pentanal will produce a primary alcohol / pentan-1-ol. $CH_3CH_2CH_2CH_2CH_2OH$ Pentan-2-one will produce a secondary alcohol / pentan-2-ol. $CH_3CH_2CH_2\underset{\displaystyle OH}{\underset{\vert}{C}}HCH_3$	• EITHER one correct classification OR one correct structure.		

(b)(i)	**A**: Propan-1-amine. (1-propanamine) **B**: Propanal. **C**: Propanoyl chloride. **D**: Propan-2-one. (propanone)	• THREE correct names.		
(ii)	**A**: *Propan-1-amine (a primary amine)* $CH_3CH_2CH_2NH_2$ (propan-1-amine) will turn moist red litmus paper blue as it is basic. $CH_3CH_2CH_2NH_2 + H_2O \rightarrow CH_3CH_2CH_2NH_3^+ + OH^-$ Water: Dissolves in water. Benedict's solution will stay blue as primary amines do not react with Benedict's reagent. **B**: *Propanal (An aldehyde)* 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. $CH_3CH_2CHO \rightarrow CH_3CH_2COOH$ **C**: *Propanoyl chloride (An acyl chloride)* Damp Litmus: Turn blue litmus red Water: Propanoyl chloride will react vigorously with water to produce propanoic acid and hydrogen chloride. $CH_3CH_2COCl + H_2O \rightarrow CH_3CH_2COOH + HCl$ 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. **D**: *Propan-2-one (A ketone)* CH_3COCH_3 (propan-2-one) Damp Litmus: No colour change. Water: Dissolves in water. Benedict's solution: No reaction, so stays blue.	• Correct reagent chosen for two substances with incomplete observations. OR ONE substance correctly identified with equation.	• 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.	• All chemicals are correctly identified with accurate observations. AND TWO appropriate symbol equations given.

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:** $CH_3COOCH_2CH_2CH_3$ **S2:** $CH_3CH_2CH_2OH$ **S3:** $CH_3CH{=}CH_2$ **S4:** $CH_3CH_2CH_2Cl$ **S5:** $CH_3CH(Cl)CH_3$ **S6:** CH_3COCl **S7:** $CH_3CONHCH_2CH_2CH_3$ Reagent **1** = H_2O / H^+ (dilute acid) Reagent **2** = conc. H^+ (H_2SO_4 or H_3PO_4) Reagent **3** = NH_3 (*alc*) or conc.	• Any THREE correct structures. • Any ONE fully correct reagent.	• At least SEVEN correct including ONE fully correct reagent.	• All structures and reagents correct.
(b)	Step 1: **Butan-1-ol to but-1-ene.** Dehydration reaction (elimination reaction) using conc H_2SO_4. $CH_3CH_2CH_2CH_2OH \xrightarrow{\text{conc } H_2SO_4} CH_3CH_2CH{=}CH_2$ Step 2: **But-1-ene to butan-2-ol.** Hydration reaction (addition reaction) using dil. H_2SO_4 (H^+/H_2O) $CH_3CH_2CH{=}CH_2 \xrightarrow{\text{dil } H_2SO_4} \underset{\text{Major product}}{CH_3CH_2CH(OH)CH_3}$ Step 3: **Butan-2-ol (Major product) to butan-2-one**. Oxidation reaction of secondary alcohol to from a ketone using $Cr_2O_7^{2-}$ / H^+ under reflux. $CH_3CH_2CH(OH)CH_3 \xrightarrow{Cr_2O_7^{2-} / H^+} CH_3CH_2COCH_3$ Other workable scheme are possible.	• ONE correct reagent. • ONE correct conversion step.	• Workable scheme, with at least one fully correct reagent.	• All correct with full understanding.

(c)(i)	One of these groups circled: 	• Ester functional group indicated.		
(ii)	 and 	• ONE correct product for hydrolysis reaction.	• 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