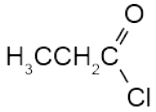
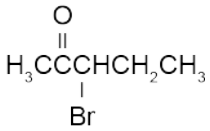
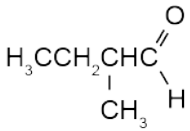
Assessment Schedule – 2015

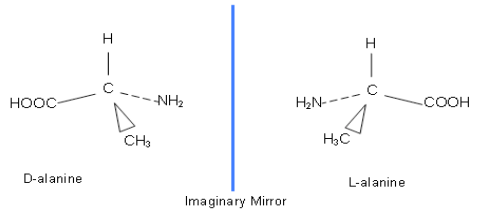
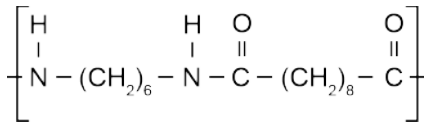
Chemistry: Demonstrate understanding of the properties of organic compounds (91391)

Evidence Statement

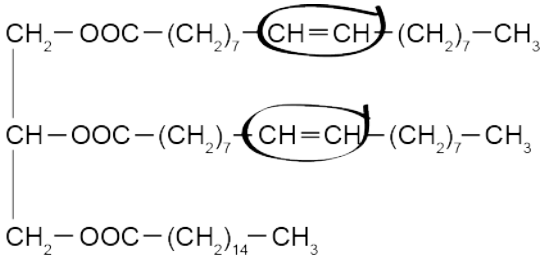
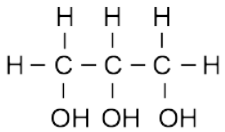
Q	Evidence	Achievement	Merit	Excellence
ONE (a)	1. Carboxylic acid or carboxyl 2. Amine or aminoalkane 3. Amide 4. Ester	• Three correct.		
(b)	  	• Two correct.		

(c)(i)	Primary $H_3C–CH_2–CH_2–CH_2–Cl$ or $H_3C–CH_2–CH(CH_3)–Cl$ Secondary $H_3C–CH(Cl)–CH_2–CH_3$ Tertiary $H_3C–CCl(CH_3)CH_3$	• Two isomers correct. (Classification not required.)	• All isomers correctly drawn and classified.	
(ii)	$Cl–CH_2–CH_2–CH_2–CH_3 \rightarrow H_2C=CH–CH_2–CH_3$ $H_3C–CH(Cl)–CH_2–CH_3 \rightarrow$ two possibilities: 1. Minor $H_2C=CH–CH_2–CH_3$ but-1-ene 2. Major $H_3C–CH=CH–CH_3$ *cis* but-2-ene and *trans* but-2-ene (in equal quantities). $H_3C–CCl(CH_3)CH_3 \rightarrow C(CH_3)(CH_3)=CH_2$ All reactions are ELIMINATION reactions as the Cl functional group and the hydrogen atom from the adjacent carbon atoms are removed. (The molecule changes from saturated to unsaturated). The secondary haloalkane produces major and minor products because the molecule is asymmetric OR it has two adjacent C atoms with different numbers of H atoms attached. The major product is formed when the H atom is removed from the adjacent C atom with the fewest H atoms attached, OR the major product has the most substituted double bond.	• Identifies two products. • Elimination. • Identifies major and minor products.	• Identifies three products. AND Explains elimination (with reference to adjacent carbon atoms). • TWO products because of asymmetry. • Identifies and explains major and minor products in terms of Saytzeff's rule.	• Fully elaborates on the elimination reactions for all three haloalkanes. (Note: Minor error or omission E.g. Cis/trans omitted – E7).

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

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
TWO (a)(i)	A chiral compound contains a carbon atom with 4 different groups attached.	• ONE correct.	• BOTH correct.	
(ii)	Same – boiling point / melting point / density / solubility. Different – enantiomers rotate plane-polarised light in different directions.			
(b)		• One correct 3-D image. OR BOTH isomers drawn but an error in the way the groups are connected to asymmetric carbon.	• Both enantiomers correct.	
(c)(i)		• Identify the repeating unit of the polymer formed.	• Explains condensation polymerisation.	
(ii)	This is condensation or substitution (polymerisation), whereby the two monomers are joined together and a small molecule (HCl(*g*)) is released. Each monomer is di-functional or has a reactive site at each end (allowing polymerisation to be ongoing.)	• Identifies condensation. OR Identifies small molecule or HCl formed. OR Identifies both monomers have reactive sites or functional groups at each end.		
(iii)	The sebacoyl chloride (as an acyl chloride) reacts vigorously with water forming the carboxylic acid, (however, it does not react with the non-polar solvent.)	• Sebacoyl chloride reacts with water.		• Fully explains the reaction occurring. (Note: Minor error or omission, e.g. amine or sebacoyl chloride reaction with water - E7).
(iv)	Dilute acid will cause hydrolysis of the amide linkage. The products formed would be (di)ammonium salt or $^{+}H_3N(CH_2)_6NH_3^{+}$ and the (di)oic acid. $HOOC(CH_2)_8COOH$ (Names not required)	• Hydrolysis. OR One functional group	• Hydrolysis AND Identifies one functional group produced (could be amine).	

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

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
THREE (a)(i)	Any one of these groups circled: 	• Functional group correct.		
(ii)	Bromine water rapidly decolourised from red or orange to colourless in an addition reaction. OR Acidified permanganate rapidly decolourised from purple to colourless in a redox or oxidation or reduction reaction.	• Incomplete description.	• Links the observation to the reaction type.	
(iii)	 $NaOOC(CH_2)_7CH=CH(CH_2)_7CH_3$ $NaOOC(CH_2)_{14}CH_3$	• ONE product correct.	• ALL products correct.	
(iv)	Increases the rate of reaction; (Condensing) prevents volatile chemicals from being lost to the environment, (The mixture refluxed to increase reaction rate without loss of product through evaporation).	• Partial explanation.	• Full explanation given.	

(b)	**Structures** A = $CH_3CH_2CH_2NH_2$ B = $CH_3CH_2CH_2OH$ C = CH_3CH_2CHO OR CH_3CH_2COOH D = $CH_3CH_2COOCH_2CH_3$ E = CH_3CH_2COCl **Reagents** 1 = NaOH(*aq*) OR KOH(*aq*) 2 = $Cr_2O_7^{2-}$ / H^+ or MnO_4^- / H^+ 3 = $NaBH_4$ OR $LiAlH_4$ 4 (i) = CH_3CH_2OH or ethanol 4 (ii) = concentrated H_2SO_4 5 = NH_3 (alcoholic / gas / conc).	• Any THREE correct structures. • Any THREE correct reagents.	• Any EIGHT correct structures / reagents.	• ALL structures and reagents correct. (Note: One error or omission – E7).

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence	1a	2a	3a	5a	2m	3m	1e (one error) + 1m	1e + 1m

Cut Scores

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