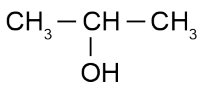
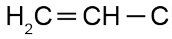
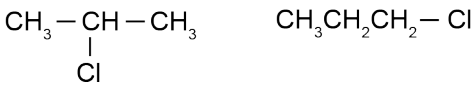
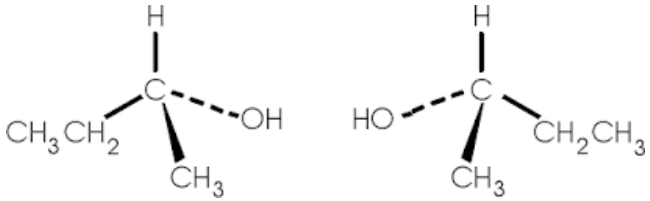
Assessment Schedule – 2017 V FINAL

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

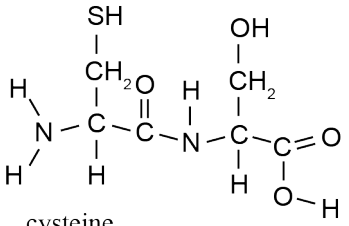
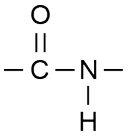
Evidence Statement

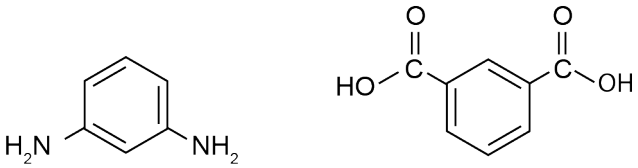
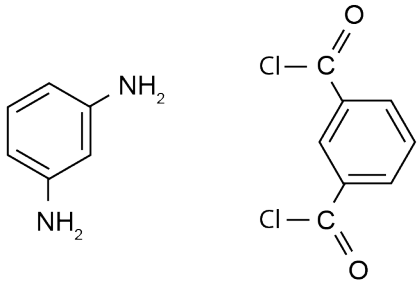
Q	Evidence	Achievement	Merit	Excellence
ONE (a)	See **Appendix A**.	• SIX correct.	• ALL correct.	
(b)	Reagent 1 = $NaBH_4$ / $LiAlH_4$ Reduction  Reagent 2 = conc. H_2SO_4 (heat) / Al_2O_3 Elimination  Addition 	• ONE correct reagent and one reaction type. • TWO correct structures.	• SEVEN correct. OR All correct showing understanding of the chemistry but with repeated error.	• ALL NINE correct, including identification of both minor and major products.
(c)(i)		Any of the following to a maximum of three: • One correct 3-D Drawing OR two 3-D drawings with the four correct groups • States that four-different species are required • Mirror images • Non-superimposable • Enantiomers will rotate plane-polarised light.	• Correct 3-D drawings and partial explanation. OR Full explanation with correct but careless drawings.	• Correct 3-D drawings with full explanation.
(ii)	There must be a carbon atom that has **four different species (groups)** attached to it. This creates two molecules that are **mirror images** of each other that are **non-superimposable**. The different isomers will **rotate (plane)-polarised light in opposite directions**. This will distinguish the isomers.			

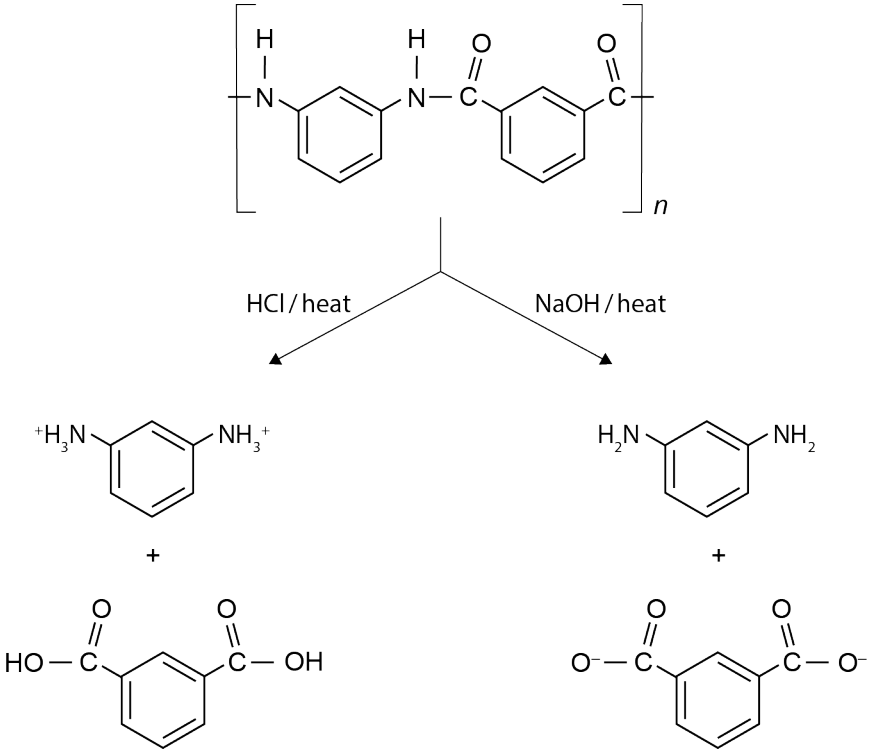
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	1a	2a	3a	5a	2m	3m	1e + 2m	2e + 1m

Q	Evidence	Achievement	Merit	Excellence
TWO (a)	See **Appendix B**.	• FOUR structures / reagents correct.	• SEVEN structures / reagents correct OR All correct showing understanding of the chemistry, but with repeated error.	• ALL correct.
(b)(i)	Aldehyde (propanal) is obtained by distillation of propan-1-ol with acidified (potassium) dichromate ($Cr_2O_7^{2-}$ / H^+). The orange colour of the $Cr_2O_7^{2-}$ / H^+ changes to (blue) green (Cr^{3+} ions). The reaction is an oxidation reaction. Distillation is a way to separate the aldehyde (propanal) from the reactant alcohol (propan-1-ol) which has a higher boiling point. The aldehyde (propanal) can react further to form a carboxylic acid (propanoic acid). This reaction is prevented if the **aldehyde is removed as it is formed** – distillation achieves this by evaporating the aldehyde and then allowing it to condense for collection.	• Distillation identified. • Identifies oxidation reaction. • Correct colour change.	• Correct colour change, reaction type and recognises the need for distillation related to different boiling points / preventing further reaction. OR Correct answer, with one omission, e.g. oxidation or colour change.	• Full explanation of how only propanal is produced in the laboratory.
(ii)	Adding blue Benedict's solution to a **warmed / heated** sample of propanal will cause a (brick) red colour to form. This happens because the propanal has been oxidised to propanoic acid / carboxylic acid (red colour is copper(I) oxide). $CH_3CH_2\underset{\underset{O}{\|}}{C}H$ + Benedict's reagent $\xrightarrow{[O]}$ $CH_3CH_2\underset{\underset{O}{\|}}{C}OH$ No change will occur when blue Benedict's solution is added to propanone, as it cannot be further oxidised / won't react.	• Recognises that only propanal will react. • ONE of the following: EITHER correct colour change OR reaction type OR equation.	• Only propanal reacts, plus any TWO of: correct reaction type, correct colour change, correct equation.	• Explanation for both aldehyde and ketone, with correct equation.

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

Q	Evidence	Achievement	Merit	Excellence
THREE (a)(i)	 cysteine serine Second dipeptide the same structure above, with the CH_2SH swapped with CH_2OH.	• ONE correct dipeptide. OR Correct section of protein (a continuing structure) OR Both essentially correct, but includes careless errors.	• BOTH dipeptides correct.	
(ii)	 Amide linkage group circled on one of the dipeptides.	• Amide linkage group circled.		

(b)	Nomex® has an amide linkage – see (a)(ii) above. Monomers:  OR  This is a condensation polymer / polyamide, as monomers join / amide link forms and a molecule of water or HCl is released during the reaction.	• ONE correct monomer OR both correct but includes careless error. • Amide functional group named and polymer, or reaction described as condensation or a polyamide • States condensation reaction with some explanation.	• Both monomers correct. • Condensation reaction fully explained.	• Full evaluation of Nomex®.

(c) (i)(ii)	Two forms of hydrolysis:  	• ONE structure correctly drawn in part (i). • ONE structure correctly drawn in part (ii).	• ONE correct reaction. (part (i) or (ii) correct). OR • All correct showing understanding of the chemistry, but with repeated error.	• BOTH reactions correct.

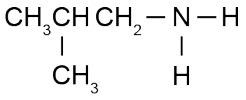
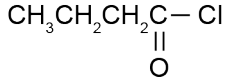
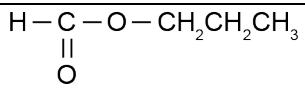
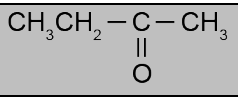
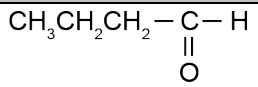
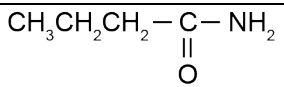
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	1a	2a	3a	5a	2m	3m	1e + 2m	2e + 1m

Cut Scores

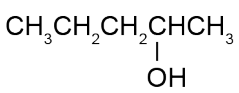
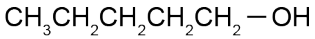
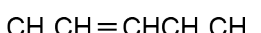
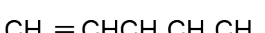
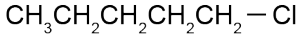
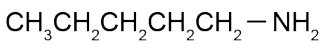
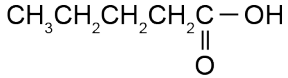
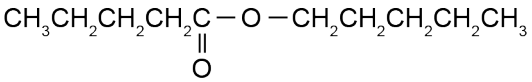
Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 14	15 – 19	20 – 24

APPENDIX A.

Question One (a) *Boxes in grey are part of the question – answers are in white boxes.*

Functional group	Structural formula	IUPAC (systematic) name
Alkene		but-1-ene
Amine		2-methylpropan-1-amine
Acyl chloride		butanoyl chloride 2-methylpropanoyl chloride
Ester		propyl methanoate
Ketone		Butanone Butan-2-one
Aldehyde		Butanal 2-methylpropanal
Amide		butanamide

APPENDIX B.
Question Two (a)

Compound	Structure
P	
Q	
R	
S	
T	
U	
V	
W	

Reagent 1	$SOCl_2$ / PCl_3 / PCl_5
Reagent 2	conc. H_2SO_4