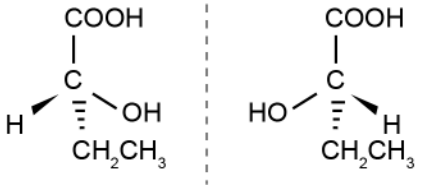
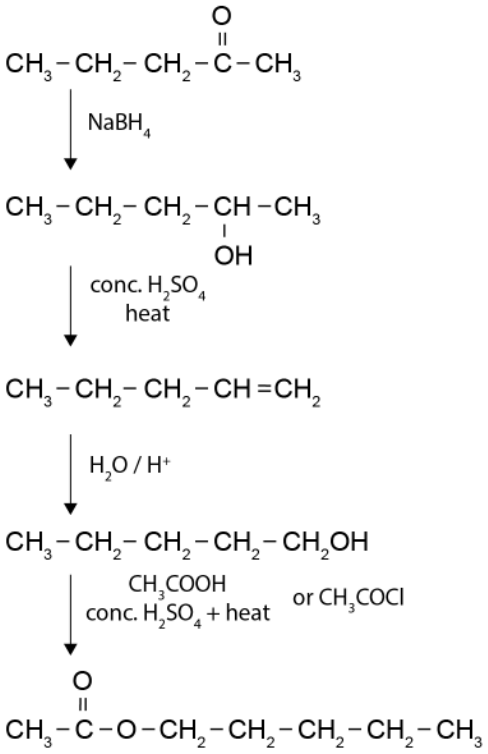
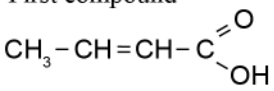
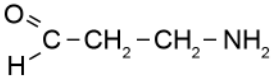
Assessment Schedule – 2023

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

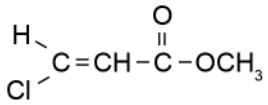
Evidence Statement

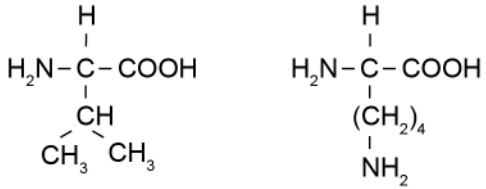
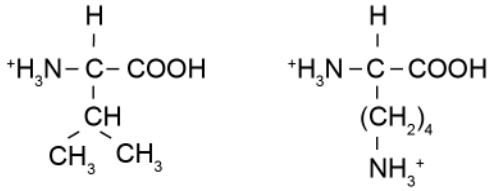
Q	Evidence	Achievement	Merit	Excellence
ONE (a)(i)	Circles asymmetric C atom (C with –OH group attached) OR circles four groups attached to asymmetric C atom. 2-hydroxybutanoic acid has an asymmetric C atom. This is a C atom with four different groups attached. This makes the molecule chiral.	• Circles correct structural feature / Describes an asymmetric C atom AND	• Describes the structural feature of enantiomers AND Draws TWO correct 3D structures of 2-hydroxybutanoic acid	
(ii)		Recognises tetrahedral arrangement of groups about asymmetric carbon atom.		

(b)		• ONE correct conversion in the scheme with reagent AND Recognises that the position of the functional group must change (makes an attempt).	• THREE correct conversions with their reagents.	• Reaction pathway correct.

(c)(i)	First compound  Compound number 6 Second compound  Compound number 3	• Identifies ONE compound correctly.		
(ii)	First compound must have a –COOH functional group, since it would undergo an acid-base reaction with Na_2CO_3 solution to produce bubbles of carbon dioxide gas. It must also have a C=C functional group, since it would undergo an oxidation/addition reaction with purple $KMnO_4$ solution to produce a brown solid. Since it is a short-chain carboxylic acid, it would be soluble in water. Second compound must have a $–NH_2$ functional group, since it is basic and would therefore produce OH^- ions in an acid-base reaction which turns the litmus paper blue. It must also have an aldehyde functional group (–CHO), since it can be oxidised when heated with Fehling's reagent. Since it is a short-chain amine, and has an aldehyde group, it would be soluble in water.	• Identifies ONE functional group/solubility linked to a stated observation for ONE compound	• For Compound 6, links ONE functional group and ONE reaction type to stated observations for the compound. • For Compound 3, links ONE functional group and ONE reaction type to stated observations for the compound.	• Justifies BOTH compounds by relating ALL observations to functional groups and reaction types.

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

Q	Evidence	Achievement	Merit	Excellence
TWO (a)(i) (ii)	Both test tubes will change colour from purple to colourless. Tollens' reagent could be heated with each of propanal and propanone. The propanal would be oxidised to propanoic acid, CH_3CH_2COOH, and a silver mirror would form. The propanone cannot be further oxidised, so no silver mirror would form.	• Correct observation for both alcohols OR Correct observation for Tollens Reagent and identifies oxidation reaction	• Explains how Tollen's reagent is used to distinguish propanal and propanone with structural formula of the product	
(b)(i) (ii)	$CH_2=CH-\underset{\displaystyle Cl}{\underset{\vert}{CH}}-COOH$ or $CH_2=CH-\underset{\displaystyle OH}{\underset{\vert}{CH}}-COCl$ 	• Identifies TWO correct functional groups / structural feature.	• ONE structure correct. AND At least ONE correct functional group for the other isomer.	• TWO correct structures.

(c)(i)		• TWO correct structural formulae of amino acids. AND		
(ii)	It is a condensation reaction because two small organic molecules (amino acids) are joined together to make a larger organic molecule (dipeptide), with one water molecule released.	Identifies condensation reaction.	• Explains condensation reaction.	• TWO correct hydrolysis products drawn with explanation of condensation reaction linked to the dipeptide example and release of water.
(iii)		• Protonates an amine group on ONE of the molecules.	• BOTH molecules have ONE amine group protonated.	

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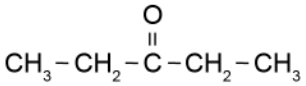
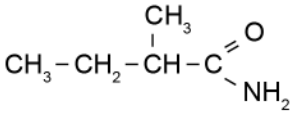
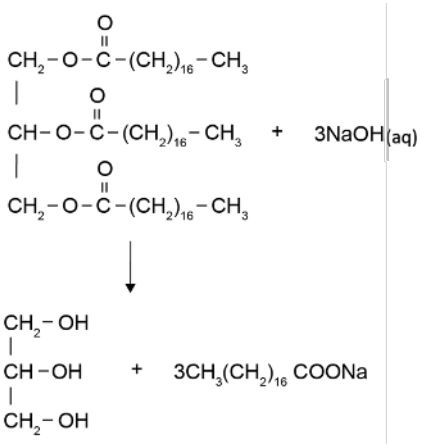
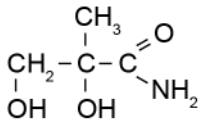
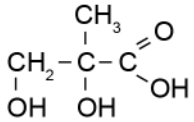
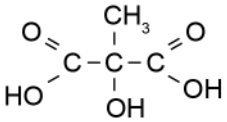
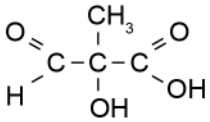
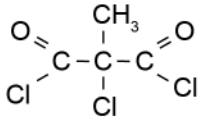
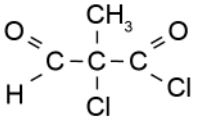
No response; no relevant evidence.	1a	2a	3a	4a	3m	4m	2e with minor error / omission in one part.	2e

Q	Evidence	Achievement	Merit	Excellence
THREE (a)	 ethyl propanoate 4-chlorohexanoyl chloride 	• THREE correct.		
(b)(i)		• Adds a strong base (H_2O/OH^- NaOH, KOH). OR ONE correct product.	• Correct structural formulae of BOTH organic products.	• BALANCED equation with correct structural formulae and indicates aqueous conditions.
(ii)	Letter B. Heating under reflux increases the reaction rate without loss of any volatile reactants and products, and ensures the reaction goes to completion.	• Selects B with ONE valid reason.	• Selects B with TWO valid reasons.	

(c)	Compound C:  Compound D:  Compound E:  (Accept: ) Compound F:  (Accept: )	• Compound C is an enantiomer and can undergo acidic hydrolysis. • TWO correct conversions of a functional group between compounds.	• Compound C correct. • TWO correct conversions from a correct Compound C. OR TWO structural formulae correct from minor error in compound C.	• THREE correct structural formulae. OR THREE structural formulae correct from minor error in compound C.

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No response; no relevant evidence.	1a	2a	3a	4a	2m	3m	2e with minor error / omission in one part.	2e

Cut Scores

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