Carboxylic Acid Derivatives - Mark Scheme

Q1.

Question number	Answer	Mark
	B diprotic carboxylic acids with diols	1

Q2.

Question number	Answer	Mark
	B the reaction is not reversible	1

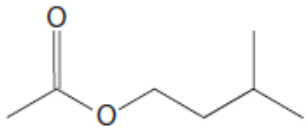
Q3.

Question number	Answer	Mark
	C hydrolysis of a nitrile by refluxing with aqueous potassium hydroxide	1

Q4.

Question number	Answer	Mark
	B ethanamide	1

Q5.

Question number	Answer	Additional guidance	Mark
(a)	• 	Must be skeletal formula	1

Question number	Answer	Additional guidance	Mark
(b)(i)	• C=O peak identified **and** range 1750 - 1735 cm^{-1}	Allow C-O peak identified **and** range 1250 - 1230 cm^{-1}	1

Question number	Answer	Additional guidance	Mark
(b)(ii)	• Absence of a peak in the range 3750 - 3200 cm^{-1}	Absence of alcoholic O-H peak	1

Question number	Answer	Additional guidance	Mark
(c)	This question assesses a student's ability to show a coherent and logically structured answer with linkages and fully-sustained reasoning. Marks are awarded for indicative content and for how the answer is structured and shows lines of reasoning. The following table shows how the marks should be awarded for indicative content. Number of indicative marking points seen in answer / Number of marks awarded for indicative marking points 6 / 4 5-4 / 3 3-2 / 2 1 / 1 0 / 0 The following table shows how the marks should be awarded for structure and lines of reasoning. Number of marks awarded for structure and sustained lines of reasoning	Guidance on how the mark scheme should be applied. The mark for indicative content should be added to the mark for lines of reasoning. For example, an answer with five indicative marking points that is partially structured with some linkages and lines of reasoning scores 4 marks (3 marks for indicative content and 1 mark for partial structure and some linkages and lines of reasoning). If there are no linkages between points, the same five indicative marking points would yield an overall score of 3 marks (3 marks for indicative content and no marks for linkages). If there is any incorrect chemistry, deduct mark(s) from the reasoning. If no reasoning mark(s) awarded, do not deduct mark(s). Comment: Look for the indicative marking points first, then consider the mark for the structure of the answer and sustained line of	6

	Answer shows a coherent and logical structure with linkages and fully sustained lines of reasoning demonstrated throughout.	2	reasoning. Some or all the information may be shown on a diagram of the molecule.	
	Answer is partially structured with some linkages and lines of reasoning.	1		
	Answer has no linkages between points and is unstructured.	0		
	Indicative points: • three groups of peaks indicates three hydrogen environments • one or two shifts identified (by number) **and** linked to alkanes • three shifts correctly identified **and** linked to alkanes • two (or more) splitting patterns correctly identified		2.1 (±0.2) = CH_3 next to C=O 4.1 (±0.2) = CH_2 next to C-O- 1.2 (±0.2) = CH_3 next to CH_2 singlet, triplet, quartet	

	• use of n + 1 rule to explain splitting for one (or more) group(s) of protons • areas under peaks/integration numbers linked to numbers of protons in each group.	ratio of areas = 3:2:3	

Question number	Answer	Additional guidance	Mark
(d)(i)	An answer that makes reference to the following points: • $HCOOCH_2CH_2CH_3$ • $HCOOCH(CH_3)_2$ • $CH_3CH_2COOCH_3$ All three correct scores two marks, any two correct scores one mark	Allow displayed/skeletal formulae	2

Question number	Answer	Additional guidance	Mark
(d)(ii)	An explanation that makes reference to the following points: • $HCOOCH(CH_3)_2$ has three carbon enviornments (1) whereas • $HCOOCH_2CH_2CH_3$ **and** $CH_3CH_2COOCH_3$ both have four carbon environments. (1)		2