

Mass Spectra and IR - Mark Scheme

Q1.

Question number	Answer	Additional guidance	Mark
(a)(i)	<ul style="list-style-type: none"> peak in the range $3750 - 3200 \text{ cm}^{-1}$ and O-H (stretching) bond in alcohols 	Must identify the bond and give the wavenumber range Allow peak at $\sim 3375 \text{ cm}^{-1}$	1

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(a)(ii)	<ul style="list-style-type: none"> not possible - All three contain the same bonds or possible - the fingerprint regions differ/by comparing the spectra to reference spectra 	No mark for unjustified answer	1

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(b)(i)	<ul style="list-style-type: none"> (all show) parent/molecular ion peak at 74 	Allow peak furthest to the right/highest m/z peak at 74 Do not award just 'peak at 74'	1

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(b)(ii)	<ul style="list-style-type: none"> fragment $^+\text{CH}_3\text{CHOH} = 45$ (1) fragment $^+\text{CH}_2\text{OH} = 31$ (1) fragment $^+(\text{CH}_3)_2\text{COH} = 59$ (1) 	Ignore missing charge on fragments	3

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(c)(i)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Organic compound used</th> <th style="width: 20%;">Name of oxidation product</th> <th style="width: 20%;">Structural formula of oxidation product</th> <th style="width: 40%;"></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">A</td> <td style="text-align: center;">Butanone and</td> <td style="text-align: center;">$\text{CH}_3\text{CH}_2\text{COCH}_3$</td> <td style="text-align: center;">(1)</td> </tr> <tr> <td style="text-align: center;">B</td> <td style="text-align: center;">Butanal (1)</td> <td style="text-align: center;">$\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$</td> <td style="text-align: center;">(1)</td> </tr> </tbody> </table>	Organic compound used	Name of oxidation product	Structural formula of oxidation product		A	Butanone and	$\text{CH}_3\text{CH}_2\text{COCH}_3$	(1)	B	Butanal (1)	$\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$	(1)	Allow displayed or skeletal formulae 1 mark for 2 correct names and 1 mark for each correct formula	3
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A	Butanone and	$\text{CH}_3\text{CH}_2\text{COCH}_3$	(1)												
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(c)(ii)	<p>An answer that makes reference to the following points:</p> <ul style="list-style-type: none"> • reagent: Benedict's/Fehling's • (oxidation product of) compound A: no change • (oxidation product of) compound B: (Benedict's/Fehling's test) red precipitate. 	<p>(1) Allow Tollens' or iodine + alkali</p> <p>(1)</p> <p>(1) (Tollens' reagent) silver mirror with (oxidation product of) B. No reaction with (oxidation product of) A</p> <p>(iodine + alkali) yellow precipitate (iodoform) with (oxidation product of) A. No reaction with oxidation product of B</p> <p>If (butanoic) acid in (c)(i), allow reagent: sodium carbonate/sodium hydrogencarbonate (solution) Observations: (oxidation product of) compound B: bubbles/fizzes</p>	3