

22. Analytical techniques

22.2 Mass spectrometry

Paper 2

Marking Scheme



Q1.

(c)(i)	M1 deduce $n = 12$ (from $Y - 1C$ (in methanol)) M2 $(100 \times x) \div (1.1 \times 100) = 12$ (so) $x = 13.2$	2
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Q2.

(a)(i)	$4 = \frac{100 \times x}{1.1 \times 50} = 2.2$	1
(a)(ii)	M1 $m/e = 29$ $C_2H_5^+$ M2 $m/e = 59$ $C_3H_7O^+$	2

Q3.

(e)(i)	 <p>M1 identify H = </p> <p>M2 (broad) absorption within the range $3600-2500\text{ cm}^{-1}$ so O-H (bond) O-H (bond) is equivalent to OH <u>bond</u></p> <p>M3 pt 1 and pt 2 ✓✓ OR pt 1 and pt 3 ✓✓</p> <ul style="list-style-type: none"> •pt 1 absorption within the range $1670-1750\text{ cm}^{-1}$ so C=O (bond) •pt 2 absorption within the range $1040-1300\text{ cm}^{-1}$ so C-O (bond) •pt 3 (M^+ at $m/e = 60$ so it has) molecular mass / $M_r = 60$ 	
(e)(ii)	oxidising agent	1

Q4.

(f)	M1 m/e 164 $(CF_2^{35}C^{179}Br)^+$ M2 m/e 166 $(CF_2^{37}C^{179}Br)^+$ AND $(CF_2^{35}C^{181}Br)^+$	2
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Q5.

(b)	$\frac{2.7}{48.7} \times \frac{100}{1.1} = 5(.04)$	1
	$M_r = 5 \times 12 + 10 \times 1 = 70$	1

Q6.

(d)	29	$C_2H_5^+$		3
	57			
	identity of Z			

Q7.

(c)(i)	Look for some reference to 116 as the mass of the molecular ion AND mass of $C_{(1)}H_{(1)}O_{(1)} = 29$ to conclude molecular formula is $C_4H_4O_4$ $116 / 29 = 4$ so $C_4H_4O_4$	1
(c)(ii)	M1 m/e 45: ^+COOH OR $^+CHO_2$ M2 m/e 71: $C_3H_3O_2^+$	2

(c)(iii)		1
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Q8.

(c)	$100 / 1.1 + 95.5 / 3.15 = 3$ carbon atoms	1
		1

Q9.

(b)	M1 $60.11/100 \times 69 + 39.89/100 \times 71$ M2 69.80	2
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