

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Level

MARK SCHEME for the May/June 2015 series**9701 CHEMISTRY****9701/52**Paper 5 (Planning, Analysis and Evaluation),
maximum raw mark 30

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Question	Expected Answer	Mark
1 (a) (i)	$2\text{H}^+(\text{aq}) + 2\text{e}^- \longrightarrow \text{H}_2(\text{g}) \quad \checkmark$ $4\text{OH}^-(\text{aq}) \longrightarrow \text{O}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l}) + 4\text{e}^- \quad \text{OR}$ $2\text{H}_2\text{O}(\text{l}) \longrightarrow \text{O}_2(\text{g}) + 4\text{H}^+(\text{aq}) + 4\text{e}^- \quad \checkmark$	[1] [1]
(ii)	Any straight line from the origin which has double the oxygen volume at a given time \checkmark	[1]
(iii)	Any straight line from the origin which has 0.45/0.75 x oxygen volume at a given time \checkmark	[1]
(b) (i)	Circuit has an ammeter in series and is complete \checkmark Gases are released at the correct electrode \checkmark Diagram shows collection of hydrogen using a means of measuring the volume of the gas \checkmark Diagram shows carbon dioxide from the anode being absorbed into a named alkali \checkmark Diagram then shows ethene being collected using a means of measuring the volume of the gas \checkmark	[1] [1] [1] [1] [1]
(ii)	The current / ammeter reading The time taken The volume of hydrogen The volume of ethene Mass of alkali before Mass of alkali after 3 of the above \checkmark 4 or more of the measurements made \checkmark	[1] [1]

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(iii)	(N =) 24 000 x C/V ✓	[1]
(iv)	N/96 500 ✓	[1]
(v)	Any correctly balanced equation for the reaction of carbon dioxide and an alkali ✓	[1]
(vi)	But-2-ene ✓	[1]
		[15]

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2 (a) (i)	$\text{Na}_2\text{CO}_3 + 2\text{HX} \longrightarrow 2\text{NaX} + \text{CO}_2 + \text{H}_2\text{O}$ ✓	[1]
(ii)	1 mol of Na_2CO_3 reacts with 2 mol of HX ✓	[1]
(b) (i)	$K_a = [\text{H}^+]^2 / [\text{HX}]$ ✓	[1]
(ii)	$[\text{H}^+] = 0.00372$ ✓ $[\text{H}^+]^2 / [\text{HX}] = 0.000138$ OR (answer above) ² /0.1 ✓ OR $\text{p}K_a = 2\text{pH} + \log[\text{HX}]$ ✓ $= 4.86 - 1$ ✓	[1] [1]
(c) (i)	All points plotted correctly ✓ Appropriate curve of best-fit is drawn ✓	[1] [1]
(ii)	Circles the point at mass of NaX = 0.3g ✓ If anomaly is below the line: NaX might not have fully dissolved/mixture not stirred/too little NaX added ✓ If anomaly is above the line; Too much NaX added	[1] [1]
(d) (i)	At pH 3.86, $[\text{HX}] = [\text{NaX}]$ OR $[\text{X}^-]$ ✓ Calculates M_r of NaX = 112 or $[\text{X}^-] = 89$ ✓ Calculates M_r of HX as 90 ✓	[1] [1] [1]
(ii)	Structure given has both an –OH and a –COOH group and has rmm = ans(d)(i) ✓	1

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(e)	Any two from: spitting HX vaporises / evaporates HX decomposes OR is thermally unstable ✓✓	[2]
		[15]