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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)	$2H^+(aq) + 2e^- \longrightarrow H_2(g)$ ✓	[1]
	$4OH^-(aq) \longrightarrow O_2(g) + 2H_2O(l) + 4e^-$ **OR** $2H_2O(l) \longrightarrow O_2(g) + 4H^+(aq) + 4e^-$ ✓	[1]
(ii)	Any straight line **from the origin** which has double the oxygen volume at a given time ✓	[1]
(iii)	Any straight line **from the origin** which has 0.45 / 0.75 x oxygen volume at a given time ✓	[1]
(b) (i)	Circuit has an ammeter in series and is complete ✓	[1]
	Gases are released at the correct electrode ✓	[1]
	Diagram shows collection of hydrogen using a means of measuring the volume of the gas ✓	[1]
	Diagram shows carbon dioxide from the anode being absorbed into a named alkali ✓	[1]
	Diagram then shows ethene being collected using a means of measuring the volume of the gas ✓	[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	[1]
	3 of the above ✓ 4 or more of the measurements made ✓	[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)	$Na_2CO_3 + 2HX \longrightarrow 2NaX + CO_2 + H_2O$ ✓	[1]
(ii)	1 mol of Na_2CO_3 reacts with 2 mol of HX ✓	[1]
(b) (i)	$K_a = [H^+]^2 / [HX]$ ✓	[1]
(ii)	$[H^+] = 0.00372$ ✓ $[H^+]^2 / [HX] = 0.000138$ **OR** (answer above)^2 / 0.1 ✓ **OR** $pK_a = 2pH + \log[HX]$ ✓ $= 4.86 - 1$ ✓	[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, [HX] = [NaX] **OR** $[X^-]$ ✓ Calculates M_r of NaX = 112 or $[X^-]$ =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]

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