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

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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International Examinations

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]

(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]

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

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