CAMBRIDGE INTERNATIONAL EXAMINATIONS GCE Advanced Level



MARK SCHEME for the October/November 2013 series

9701 CHEMISTRY

9701/51

Paper 5 (Planning, Analysis, 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.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.



Page 2	Mark Scheme	Syllabus	Paper
	GCE A LEVEL – October/November 2013	9701	51

Question	Expected Answer	Mark
1 (a) (i)	(The temperature would) decrease	1
	The lattice enthalpy is more negative/exothermic than the (sum of the) enthalpies/energies of hydration.	1
(ii)	enthalpies/energies of hydration.	2
	90 Event device is a property of the second control of the	

Page 3		Mark Scheme	Syllabus	Paper
		GCE A LEVEL – October/November 2013	9701	51
(b) (i)	со	ncentration/concentration change		
(ii)	ter	nperature change/decrease in temperature (allow ecf	on (a)(i))	1
(c)		agram shows a container labelled with its capacity (be d 250 cm³) and with the thermometer in a solution.	tween 25 cm ³	1
	Th	e apparatus is insulated and has a lid.		1
		ermometer range must include 25 °C and with a precis I°C and 0.5 °C.	sion of between	1
(d)	A١	minimum of 5 workable experiments using masses or	concentrations.	1
	Me	easures initial and final temperatures.		1
		easures a volume of water AND the volume of water w ntainer labelled in (c).	ill fit into	1
	Sta	ates a mass which is the maximum for a volume of wa	ter stated.	1
(e)	Ammonium nitrate may cause a fire/explosion so must not be ground up OR dilute to less than 0.5 mol dm ^{-3} before disposal.		1	
(f)	Ma Vo Ini Fir Te	olumns must include units: ass of ammonium nitrate used / any mass unit olume / mass of water used / any volume or mass units tial temperature / °C mal temperature / °C mperature fall / change in temperature / °C oncentration of ammonium nitrate / any concentration u		
	_	ur columns correct /e or six columns correct		1 1
				[Total: 15]

GCE A LEVEL - October/November 20139701512(a) F GH solubility D-C / gC-B / g[(F × 100)] / G / g/ 100 g1.2525.005.001.2525.0020.007.7619.4040.0011.1123.0048.3011.7525.0047.009.6221.0045.819.1020.0045.8111.2525.0044.5011.2525.0045.0013.3530.0044.50Heading for final column calculating the solubility is given correctly with units.1All data is to 2 decimal places. Allow 1 error. Data in final column is correct. Allow 1 error in computation.1(b)The x-axis must start at zero and be labelled 'temperature / °C' OR T / °C and y-axis as 'solubility (of sodium sulfate) g/100g'. Plotted points must cover at least half the grid in both directions.1All 10 points plotted correctly.1First (left-hand) curve is smooth passing through (or extremely close to) all the points and does not deviate to accommodate a mis-plot or incorrect point. Curve intersects with a second curve at or above the candidate's solubility for experiment 5.1(c)the temperature is read correctly1(d)(i)Cross is on the 40 g / 100 g line and to the right of the point plotted at 30°C.1(e)Solubility is read correctly1(e)Solubility is 47.6 (g / 100g) 1.2% OR 1.2% OR 1.2% OR 1.3%1	Page 4		Mark Scheme	Syllabus	Paper
D-C / gC-B / g[[F * 100]] / G / g' 100 g1.2525.005.001.2525.0020.001.2520.006.255.0025.0048.3011.1123.0048.3011.7525.0047.009.6221.0045.819.1020.0045.5011.2525.0044.5011.2525.0044.5011.2525.0044.5011.2525.0044.5011.3530.0044.50Heading for final column calculating the solubility is given correctly with units.1All data is to 2 decimal places. Allow 1 error. Data in final column is correct. Allow 1 error in computation.1(b)The x-axis must start at zero and be labelled 'temperature / °C' OR T / °C and y-axis as 'solubility (of sodium sulfate) g/100g'. Plotted points must cover at least half the grid in both directions.1All 10 points plotted correctly.1First (left-hand) curve is smooth passing through (or extremely close to) all the points and does not deviate to accommodate a mis-plot or incorrect point.1(c)the temperature is read correctly the solubility is read correctly1(c)the temperature is read correctly the solubility is read correctly the solubility is read correctly1(d) (i)Cross is on the 40 g / 100 g line and to the right of the point plotted at 30 °C.1(e)Solubility is 47.6 (g / 100g)1		GCE A LEVEL	– October/November 20	13 9701	51
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$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$			_	100 g	
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	(ii)	-	-	ection of curves would	1
1 2% OR 1 21% OR 1 28% OR 1 3%	(e)	Solubility is 47.6 (g / 10	00g)		1
			28% OP 1 2%		4

Page 5	5 Mark Scheme	Syllabus	Paper
	GCE A LEVEL – October/November 2013	9701	51
(f)	$\begin{array}{c} Na_2SO_4.10H_2O\\ endothermic because solubility increases with increasing ten (or reverse argument)\\ Na_2SO_4\\ exothermic because solubility decreases with increasing ten (or reverse argument)\\ \end{array}$		
	For endothermic and exothermic correctly assigned For providing the correct reasons		1
			[Total: 1