
CHEMISTRY

9701/51

Paper 5 Planning, Analysis and Evaluation

May/June 2017

MARK SCHEME

Maximum Mark: 30

Published

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 May/June 2017 series for most Cambridge IGCSE[®], Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

PUBLISHED

Question	Answer	Marks
1(a)	diagram of a labelled insulated container containing a liquid	1
	labelled timing device and a labelled thermometer in / touching the liquid	1
1(b)	to ensure temperature of water / experiment / apparatus is at room temperature / constant temperature	1
1(c)	the (anhydrous) calcium chloride is added at this point	1
1(d)	not all the CaCl_2 has dissolved (in the first minute) OR dissolving / reaction was not complete	1
1(e)	the cooling curve has a straight line of best fit that extrapolates to 3.0 minutes (or beyond) AND a straight line connecting all the points from 0–2.5 minutes that extrapolates to 3.0 minutes (or beyond)	1
	theoretical temperature rise to 1dp	1
1(f)	8.5 min AND not enough time to reach solution temperature OR it takes time for the thermometer to reach equilibrium with the water temperature	1
1(g)	ensure uniformity of heating (of solution)	1
1(h)	wear gloves OR wear (face) mask	1

PUBLISHED

Question	Answer	Marks
1(i)	$75.0 \times 4.18 \times 30.0 = 9405 \text{ (J) OR } 9.405 \text{ kJ}$	1
	(1 mol of $\text{CaCl}_2 = 111.1 \text{ g}$)	1
	Mass CaCl_2 required = $\frac{9.405}{82.5} \times 111.1 = 12.7 \text{ g}$	
	Total:	12

Question	Answer	Marks
2(a)(i)	points plotted correctly from table	1
	line through origin	1
2(a)(ii)	point at 0.045 g cm^{-3}	1
2(a)(iii)	two sets of coordinates shown.	1
	gradient correctly calculated expected value = $66\text{--}67(^{\circ})$	1
	value must be to 2 dp	
2(b)(i)	$0.0750 \times 250 = \mathbf{18.75} \text{ (g)}$	1
2(b)(ii)	dissolve the sucrose / mass of sucrose given in 2(b)(i) / weighed mass in a stated volume of (distilled) water, less than 250 cm^3 , or if not stated but then later made up to 250 cm^3 / up to the mark	1
	transfer solution to (a 250 cm^3) volumetric flask AND Make up the solution to the mark / flask volume with (distilled) water	1

PUBLISHED

Question	Answer	Marks
2(c)(i)	$\left(\frac{0.0350}{0.0750} \times 15.00 = 7.00 \text{ cm}^3 \right)$ Volume of standard solution = 7.00 (cm ³) Volume of distilled water = 8.00 (cm ³)	1
2(c)(ii)	burette / graduated pipette	1
2(c)(iii)	solution was more dilute than expected	1
2(d)	3.75 correctly read off graph (0.056–0.057)(g cm ⁻³) or correctly calculated from 3.75 = 2(a)(iii) × concentration	1
	conc of sucrose = (56–57)(g dm ⁻³) or multiplying a concentration by 1000 correctly	1
	conc of sucrose = (0.164–0.167)(mol dm ⁻³) or dividing a concentration by M _r / (342) correctly	1
2(e)	wash out with small volume of solution of concentration to be used	1
2(f)	predicted value: (+)10.10 / 10.1 or twice value at 0.075 taken from graph	1
	explanation: (The plane polarised light encounters) more (twice) molecules / moles / amount of sucrose	1
2(g)	To calibrate the instrument / to set the polarimeter to 0 degrees	1
	Total:	18

CHEMISTRY

9701/52

Paper 5 Planning, Analysis and Evaluation

May/June 2017

MARK SCHEME

Maximum Mark: 30

Published

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 May/June 2017 series for most Cambridge IGCSE[®], Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

PUBLISHED

Question	Answer	Marks
1(a)	Any two from Hazard: toxic to aquatic organisms And Precaution: do not dispose of (lead and lead compounds) into the water waste / down the drain Or Hazard: may cause long-term damage to aquatic environment And Precaution: do not dispose of (lead and lead compounds) into the water waste / down the drain Or Hazard: harmful by inhalation And Precaution: carry out in fume cupboard, well-ventilated room Or Hazard: harmful by swallowing And Precaution: wear gloves	2

PUBLISHED

Question	Answer				Marks
1(b)	Lead oxide	mass of lead / g	mass of oxygen / g	mass of lead combining with 1.00 g oxygen / g	
	A	3.78	0.27	14.0	
	B	3.36	0.48	7.0	
	C	4.83	0.46	10.5	
	All values correct in mass of lead and mass of oxygen columns. and shown to two decimal places.				1
	Correct values in the final column to 1 decimal place				1
1(c)(i)	2.0; 1.0; 1.5; OR 4:2:3				1
1(c)(ii)	Yes and The simple whole number ratio is 4:2:3				1
1(d)	(The different) lead oxide(s)				1
	Mass of lead combined with 1 g of oxygen				1
1(e)(i)	PbO ₂				1
1(e)(ii)	Relative formula mass or relative molecular mass / M _r				1
1(f)	To prevent oxidation or re-oxidation (of lead)				1
1(g)	Re-heat the lead (oxide) and re-weigh until there is no further loss in mass.				1
	Total:				12

PUBLISHED

Question	Answer	Marks
2(a)(i)	To calibrate the instrument	1
2(a)(ii)	In case some of the light is absorbed by the water / fingerprints / dirt	1
2(b)(i)	4.74 g	1
2(b)(ii)	Dissolve (4.74 g / answer to 2(b) of) KMnO_4 in (a container with) (distilled water) (in less than 1 dm^3 of water)	1
	(Transfer / add to) a (1 dm^3) volumetric flask; make to mark (with [distilled] water) (and shake) NOTE: Distilled/deionised/purified water must be mentioned for 2 marks to be awarded.	1
2(b)(iii)	The mass of KMnO_4 is too small to weigh accurately (on a 2dp balance).	1
2(c)	529.5	1
2(d)(i)	All points plotted correctly	1
	Line of best fit drawn	1
2(d)(ii)	The concentration is (directly) proportional to the absorbance,	1
	The more ions there are, the more light is absorbed (or a)	1
2(d)(iii)	Yes because most of the points lie close to the line.	1
2(e)(i)	22.50 (cm^3) 2.50 (cm^3)	1
2(e)(ii)	Burette (with 0.1 cm^3 graduations)	1
2(f)(i)	Read value from graph. Expected result $2.50 \times 10^{-4} \text{ mol dm}^{-3}$	1
2(f)(ii)	$2.50 \times 10^{-4} \times 54.9 \times (100 / 1000) = 1.37 \times 10^{-3} \text{ g}$	1

PUBLISHED

Question	Answer	Marks
2(g)	$\frac{1.37 \times 10^{-3}}{1.209} \times 100 = 0.113\%$	1
2(h)	So that any excess oxidising agent will not react with / oxidise the $\text{Fe}^{2+}(\text{aq})$	1
	Total:	18

CHEMISTRY

9701/53

Paper 5 Planning, Analysis and Evaluation

May/June 2017

MARK SCHEME

Maximum Mark: 30

Published

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 May/June 2017 series for most Cambridge IGCSE[®], Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

PUBLISHED

Question	Answer	Marks
1(a)	diagram of a labelled insulated container containing a liquid	1
	labelled timing device and a labelled thermometer in / touching the liquid	1
1(b)	to ensure temperature of water / experiment / apparatus is at room temperature / constant temperature	1
1(c)	the (anhydrous) calcium chloride is added at this point	1
1(d)	not all the CaCl_2 has dissolved (in the first minute) OR dissolving / reaction was not complete	1
1(e)	the cooling curve has a straight line of best fit that extrapolates to 3.0 minutes (or beyond) AND a straight line connecting all the points from 0–2.5 minutes that extrapolates to 3.0 minutes (or beyond)	1
	theoretical temperature rise to 1dp	1
1(f)	8.5 min AND not enough time to reach solution temperature OR it takes time for the thermometer to reach equilibrium with the water temperature	1
1(g)	ensure uniformity of heating (of solution)	1
1(h)	wear gloves OR wear (face) mask	1

PUBLISHED

Question	Answer	Marks
1(i)	$75.0 \times 4.18 \times 30.0 = 9405 \text{ (J) OR } 9.405 \text{ kJ}$	1
	(1 mol of $\text{CaCl}_2 = 111.1 \text{ g}$)	1
	Mass CaCl_2 required = $\frac{9.405}{82.5} \times 111.1 = 12.7 \text{ g}$	
	Total:	12

Question	Answer	Marks
2(a)(i)	points plotted correctly from table	1
	line through origin	1
2(a)(ii)	point at 0.045 g cm^{-3}	1
2(a)(iii)	two sets of coordinates shown.	1
	gradient correctly calculated expected value = $66\text{--}67(^{\circ})$	1
	value must be to 2 dp	
2(b)(i)	$0.0750 \times 250 = \mathbf{18.75} \text{ (g)}$	1
2(b)(ii)	dissolve the sucrose / mass of sucrose given in 2(b)(i) / weighed mass in a stated volume of (distilled) water, less than 250 cm^3 , or if not stated but then later made up to 250 cm^3 / up to the mark	1
	transfer solution to (a 250 cm^3) volumetric flask AND Make up the solution to the mark / flask volume with (distilled) water	1

PUBLISHED

Question	Answer	Marks
2(c)(i)	$\left(\frac{0.0350}{0.0750} \times 15.00 = 7.00 \text{ cm}^3 \right)$ Volume of standard solution = 7.00 (cm ³) Volume of distilled water = 8.00 (cm ³)	1
2(c)(ii)	burette / graduated pipette	1
2(c)(iii)	solution was more dilute than expected	1
2(d)	3.75 correctly read off graph (0.056–0.057)(g cm ⁻³) or correctly calculated from 3.75 = 2(a)(iii) × concentration	1
	conc of sucrose = (56–57)(g dm ⁻³) or multiplying a concentration by 1000 correctly	1
	conc of sucrose = (0.164–0.167)(mol dm ⁻³) or dividing a concentration by M _r / (342) correctly	1
2(e)	wash out with small volume of solution of concentration to be used	1
2(f)	predicted value: (+)10.10 / 10.1 or twice value at 0.075 taken from graph	1
	explanation: (The plane polarised light encounters) more (twice) molecules / moles / amount of sucrose	1
2(g)	To calibrate the instrument / to set the polarimeter to 0 degrees	1
	Total:	18