

Cambridge
International
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CHEMISTRY

9701/52

Paper 5 Planning, Analysis and Evaluation

May/June 2017

MARK SCHEME

Maximum Mark: 30

Published

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This document consists of **5** printed pages.

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Question	Answer	Marks
1(a)	<p>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</p> <p>Or</p> <p>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</p> <p>Or</p> <p>Hazard: harmful by inhalation And Precaution: carry out in fume cupboard, well-ventilated room</p> <p>Or</p> <p>Hazard: harmful by swallowing And Precaution: wear gloves</p>	2

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Question	Answer				Marks																
1(b)	<table border="1" data-bbox="291 231 952 566"> <thead> <tr> <th data-bbox="291 231 465 414">Lead oxide</th> <th data-bbox="465 231 568 414">mass of lead /g</th> <th data-bbox="568 231 734 414">mass of oxygen /g</th> <th data-bbox="734 231 952 414">mass of lead combining with 1.00 g oxygen /g</th> </tr> </thead> <tbody> <tr> <td data-bbox="291 414 465 462">A</td> <td data-bbox="465 414 568 462">3.78</td> <td data-bbox="568 414 734 462">0.27</td> <td data-bbox="734 414 952 462">14.0</td> </tr> <tr> <td data-bbox="291 462 465 510">B</td> <td data-bbox="465 462 568 510">3.36</td> <td data-bbox="568 462 734 510">0.48</td> <td data-bbox="734 462 952 510">7.0</td> </tr> <tr> <td data-bbox="291 510 465 566">C</td> <td data-bbox="465 510 568 566">4.83</td> <td data-bbox="568 510 734 566">0.46</td> <td data-bbox="734 510 952 566">10.5</td> </tr> </tbody> </table>				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	
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A	3.78	0.27	14.0																		
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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																

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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 (ora)	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

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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