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**CHEMISTRY**

**9701/52**

Paper 5 Planning, Analysis and Evaluation

**May/June 2017**

MARK SCHEME

Maximum Mark: 30

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**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.

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
1(a)	<p>Any <b>two</b> from Hazard: toxic to aquatic organisms <b>And</b> 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 <b>And</b> 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 <b>And</b> Precaution: carry out in fume cupboard, well-ventilated room</p> <p>Or</p> <p>Hazard: harmful by swallowing <b>And</b> Precaution: wear gloves</p>	<b>2</b>

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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	
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																		
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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 <sub>2</sub>				1																
1(e)(ii)	Relative formula mass or relative molecular mass / M <sub>r</sub>				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																
	<b>Total:</b>				<b>12</b>																

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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) $\text{KMnO}_4$ in (a container with) (distilled water) (in less than $1 \text{ dm}^3$ of water)	1
	(Transfer / add to) a ( $1 \text{ dm}^3$ ) 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 $\text{KMnO}_4$ 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)	<b>22.50</b> ( $\text{cm}^3$ ) <b>2.50</b> ( $\text{cm}^3$ )	1
2(e)(ii)	Burette (with $0.1 \text{ cm}^3$ 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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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
2(g)	$\frac{1.37 \times 10^{-3}}{1.209} \times 100 = 0.113\%$	<b>1</b>
2(h)	So that any excess oxidising agent will not react with / oxidise the $\text{Fe}^{2+}(\text{aq})$	<b>1</b>
	<b>Total:</b>	<b>18</b>