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**CHEMISTRY**

**9701/35**

Paper 3 Advanced Practical Skills 1

**May/June 2017**

MARK SCHEME

Maximum Mark: 40

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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)	<b>I</b> Constructs a table for results showing volume of <b>FA 1</b> , volume of water, reaction time, reaction rate for all experiments carried out	<b>1</b>
	<b>II</b> Appropriate headings and units for recorded data given. Volumes in $\text{cm}^3$ or $/\text{cm}^3$ or $(\text{cm}^3)$ . Time in seconds or $/\text{s}$ or $(\text{s})$ . All volumes except zero given to .00.	<b>1</b>
	<b>III</b> All times recorded to the nearest second.	<b>1</b>
	<b>IV</b> 3 additional volumes chosen intervals not less than $2.00\text{ cm}^3$ and all volumes of <b>FA 1</b> $\geq 6.00\text{ cm}^3$ and one volume of <b>FA 1</b> $\leq 8.00\text{ cm}^3$	<b>1</b>
	<b>V</b> In all 3 additional experiments water is added to make a total of $20.00\text{ cm}^3$	<b>1</b>
	<b>VI + VII</b> Compare time for $20.00\text{ cm}^3$ of <b>FA 1</b> with that of supervisor. 2 marks for $\pm 3\text{ s}$ 1 mark for $\pm 5\text{ s}$	<b>2</b>
	<b>VIII</b> Compare ratio of time for $10.00\text{ cm}^3$ of <b>FA 1</b> / time for $20.00\text{ cm}^3$ of <b>FA 1</b> . 1 mark for ratio between 1.8 – 2.2	<b>1</b>
	<b>IX</b> All rates correctly calculated using $500 / \text{time}$ (minimum 2 sf and 1 dp)	<b>1</b>
	<b>X</b> Units for rate given as $\text{s}^{-1}$	<b>1</b>

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Question	Answer	Marks
1(b)	<b>I</b> Rate on <i>y</i> -axis and volume on <i>x</i> -axis. Axes clearly labelled <b>and</b> suitable linear scales.	<b>1</b>
	<b>II</b> Scale chosen to use more than half of each axis for origin and plotted points	<b>1</b>
	<b>III</b> All points plotted correctly to within half a square and in the correct square.	<b>1</b>
	<b>IV</b> Draws a line of best fit. This may be a straight line or a smooth curve with anomalous points indicated.	<b>1</b>
1(c)	Rate is (directly) <b>proportional</b> to concentration of peroxodisulfate or comment suitable to shape of graph	<b>1</b>
1(d)(i)	Reads rate from graph correct to one small square and shows use of this number in calculation	<b>1</b>
	Shows use of $500 / \text{rate}$	<b>1</b>
1(d)(ii)	Correctly calculates $(0.5 / \text{time for expt 1}) \times 100$ to 2 or more sf	<b>1</b>
1(d)(iii)	The student is correct as the reaction time would be longer and so the (percentage) error reduced.	<b>1</b>
1(d)(iv)	There is so much thiosulfate that all the iodide reacts so there is no iodine to turn the starch blue-black.	<b>1</b>

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
1(e)(i)	Record time to nearest second with units of s	1
	Candidate's time compared with that from Expt 1. 1 mark for $\pm 3$ s	1
1(e)(ii)	Estimates a time as $4 \times$ ans (i)	1
	Time / rate related to <b>concentration</b> of $\text{S}_2\text{O}_3^{2-}$ / <b>FA 3</b> Increased concentration of <b>FA 3</b> increases time of reaction / time longer / decreases rate of reaction / rate lower / smaller / reaction slower.	1
	<b>Total:</b>	<b>24</b>

Question	Answer	Marks																								
<b>FA 4 is <math>(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2</math> FA 5 is <math>\text{KAl}(\text{SO}_4)_2</math> FA 6 is <math>\text{Na}_2\text{SO}_3</math> FA 7 is <math>\text{H}_2\text{SO}_4</math> FA 8 is <math>\text{NaNO}_2</math></b>																										
2(a)(i)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th data-bbox="427 331 580 461" rowspan="2"><i>test</i></th> <th colspan="2" data-bbox="580 331 1411 395"><i>observation</i></th> <th data-bbox="1411 331 1561 461" rowspan="2"><i>mark</i></th> </tr> <tr> <th data-bbox="580 395 992 461"><b>FA 4</b></th> <th data-bbox="992 395 1411 461"><b>FA 5</b></th> </tr> </thead> <tbody> <tr> <td data-bbox="427 461 580 598" rowspan="2">+ NaOH</td> <td data-bbox="580 461 992 531">green ppt</td> <td data-bbox="992 461 1411 531">white ppt</td> <td data-bbox="1411 461 1561 531" style="text-align: center;">1</td> </tr> <tr> <td data-bbox="580 531 992 598">insoluble in excess</td> <td data-bbox="992 531 1411 598">soluble in excess</td> <td data-bbox="1411 531 1561 598" style="text-align: center;">1</td> </tr> <tr> <td data-bbox="427 598 580 703">then warm</td> <td data-bbox="580 598 992 703">gas / ammonia turns (damp red) litmus blue</td> <td data-bbox="992 598 1411 703">no reaction / litmus stays red</td> <td data-bbox="1411 598 1561 703" style="text-align: center;">1</td> </tr> <tr> <td data-bbox="427 703 580 871" rowspan="2">+ NH<sub>3</sub></td> <td data-bbox="580 703 992 871">green ppt and turning brown (in air) in either alkali test</td> <td data-bbox="992 703 1411 871">white ppt</td> <td data-bbox="1411 703 1561 871" style="text-align: center;">1</td> </tr> <tr> <td data-bbox="580 871 992 938">insoluble in excess</td> <td data-bbox="992 871 1411 938">insoluble in excess</td> <td data-bbox="1411 871 1561 938" style="text-align: center;">1</td> </tr> </tbody> </table>	<i>test</i>	<i>observation</i>		<i>mark</i>	<b>FA 4</b>	<b>FA 5</b>	+ NaOH	green ppt	white ppt	1	insoluble in excess	soluble in excess	1	then warm	gas / ammonia turns (damp red) litmus blue	no reaction / litmus stays red	1	+ NH <sub>3</sub>	green ppt and turning brown (in air) in either alkali test	white ppt	1	insoluble in excess	insoluble in excess	1	<b>5</b>
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Question	Answer	Marks
2(a)(ii)	<b>FA 4</b> contains $\text{NH}_4^+$ and $\text{Fe}^{2+}$ <b>FA 5</b> contains $\text{Al}^{3+}$ 2 marks for all three correct 1 mark for any two correct	<b>2</b>
2(b)	Selects $\text{BaCl}_2(\text{aq})$ or $\text{Ba}(\text{NO}_3)_2(\text{aq})$ followed by appropriate acid (acid must be named) <b>OR</b> Selects acidified potassium manganate(VII) <b>OR</b> Selects named acid and tests gas with acidified potassium manganate(VII)	<b>1</b>
	White ppt that is soluble in acid <b>OR</b> Decolourises (potassium manganate(VII))	<b>1</b>
	$\text{SO}_3^{2-}$	<b>1</b>
2(c)(i)	<b>+ Mg</b> Effervescence / fizzing / bubbles	<b>1</b>
	Gas / $\text{H}_2$ / fizz pops with a lighted splint	<b>1</b>
	<b>+ FA 8</b> Brown (yellow / orange) fumes <b>or</b> gas turns blue litmus red/bleached <b>or</b> blue solution	<b>1</b>
2(c)(ii)	$\text{H}_2\text{SO}_4$	<b>1</b>
	$\text{NaNO}_2$	<b>1</b>
2(c)(iii)	$\text{Mg}(\text{s}) + 2\text{H}^+(\text{aq}) \rightarrow \text{Mg}^{2+}(\text{aq}) + \text{H}_2(\text{g})$	<b>1</b>
	<b>Total:</b>	<b>16</b>