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CHEMISTRY

9701/35

Paper 3 Advanced Practical Skills 1

May/June 2017

MARK SCHEME

Maximum Mark: 40

Published

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

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

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Question	Answer	Marks
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 ± 3 s	1
1(e)(ii)	Estimates a time as 4 \times ans (i)	1
	Time / rate related to concentration of $\text{S}_2\text{O}_3^{2-}$ / FA 3 Increased concentration of FA 3 increases time of reaction / time longer / decreases rate of reaction / rate lower / smaller / reaction slower.	1
	Total:	24

Question	Answer	Marks																								
FA 4 is $(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2$ FA 5 is $\text{KAl}(\text{SO}_4)_2$ FA 6 is Na_2SO_3 FA 7 is H_2SO_4 FA 8 is NaNO_2																										
2(a)(i)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th data-bbox="427 331 577 459" rowspan="2"><i>test</i></th> <th colspan="2" data-bbox="577 331 1413 395"><i>observation</i></th> <th data-bbox="1413 331 1561 459" rowspan="2"><i>mark</i></th> </tr> <tr> <th data-bbox="577 395 992 459">FA 4</th> <th data-bbox="992 395 1413 459">FA 5</th> </tr> </thead> <tbody> <tr> <td data-bbox="427 459 577 600" rowspan="2">+ NaOH</td> <td data-bbox="577 459 992 531">green ppt</td> <td data-bbox="992 459 1413 531">white ppt</td> <td data-bbox="1413 459 1561 531" style="text-align: center;">1</td> </tr> <tr> <td data-bbox="577 531 992 600">insoluble in excess</td> <td data-bbox="992 531 1413 600">soluble in excess</td> <td data-bbox="1413 531 1561 600" style="text-align: center;">1</td> </tr> <tr> <td data-bbox="427 600 577 703">then warm</td> <td data-bbox="577 600 992 703">gas / ammonia turns (damp red) litmus blue</td> <td data-bbox="992 600 1413 703">no reaction / litmus stays red</td> <td data-bbox="1413 600 1561 703" style="text-align: center;">1</td> </tr> <tr> <td data-bbox="427 703 577 871" rowspan="2">+ NH₃</td> <td data-bbox="577 703 992 871">green ppt and turning brown (in air) in either alkali test</td> <td data-bbox="992 703 1413 871">white ppt</td> <td data-bbox="1413 703 1561 871" style="text-align: center;">1</td> </tr> <tr> <td data-bbox="577 871 992 938">insoluble in excess</td> <td data-bbox="992 871 1413 938">insoluble in excess</td> <td data-bbox="1413 871 1561 938" style="text-align: center;">1</td> </tr> </tbody> </table>	<i>test</i>	<i>observation</i>		<i>mark</i>	FA 4	FA 5	+ 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 ₃	green ppt and turning brown (in air) in either alkali test	white ppt	1	insoluble in excess	insoluble in excess	1	5
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Question	Answer	Marks
2(a)(ii)	FA 4 contains NH_4^+ and Fe^{2+} FA 5 contains Al^{3+} 2 marks for all three correct 1 mark for any two correct	2
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) OR Selects acidified potassium manganate(VII) OR Selects named acid and tests gas with acidified potassium manganate(VII)	1
	White ppt that is soluble in acid OR Decolourises (potassium manganate(VII))	1
	SO_3^{2-}	1
2(c)(i)	+ Mg Effervescence / fizzing / bubbles	1
	Gas / H_2 / fizz pops with a lighted splint	1
	+ FA 8 Brown (yellow / orange) fumes or gas turns blue litmus red/bleached or blue solution	1
2(c)(ii)	H_2SO_4	1
	NaNO_2	1
2(c)(iii)	$\text{Mg}(\text{s}) + 2\text{H}^+(\text{aq}) \rightarrow \text{Mg}^{2+}(\text{aq}) + \text{H}_2(\text{g})$	1
	Total:	16