Cambridge International AS & A Level

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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 / cm^3 or (cm^3). Time in seconds or / 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** $\geqslant$ 6.00 cm^3 and one volume of **FA 1** $\leqslant$ 8.00 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 ± 3 s 1 mark for ± 5 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 / 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 *y-axis* and volume on *x-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 / rate	**1**
1(d)(ii)	Correctly calculates (0.5 / time for expt 1) × 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 × ans **(i)**	**1**
	Time / rate related to **concentration** of $S_2O_3^{2-}$ / **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**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td colspan="3">FA 4 is $(NH_4)_2Fe(SO_4)_2$ FA 5 is $KAl(SO_4)_2$ FA 6 is Na_2SO_3 FA 7 is H_2SO_4 FA 8 is $NaNO_2$</td></tr>
<tr><td>2(a)(i)</td><td>
<table>
<tr><th rowspan="2">test</th><th colspan="2">observation</th><th rowspan="2">mark</th></tr>
<tr><th>FA 4</th><th>FA 5</th></tr>
<tr><td rowspan="2">+ NaOH</td><td>green ppt</td><td>white ppt</td><td>1</td></tr>
<tr><td>insoluble in excess</td><td>soluble in excess</td><td>1</td></tr>
<tr><td>then warm</td><td>gas / ammonia turns (damp red) litmus blue</td><td>no reaction / litmus stays red</td><td>1</td></tr>
<tr><td rowspan="2">+ NH_3</td><td>green ppt

and turning brown (in air) in either alkali test</td><td>white ppt</td><td>1</td></tr>
<tr><td>insoluble in excess</td><td>insoluble in excess</td><td>1</td></tr>
</table>
</td><td>5</td></tr>
</table>

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 $BaCl_2$(aq) or $Ba(NO_3)_2$(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)	$Mg(s) + 2H^+(aq) \rightarrow Mg^{2+}(aq) + H_2(g)$	**1**
	Total:	**16**

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