Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CHEMISTRY **9701/35**

Paper 3 Advanced Practical Skills 1 **May/June 2017**

MARK SCHEME

Maximum Mark: 40

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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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**

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**

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>+ NaOH</td><td>green ppt</td><td>white ppt</td><td>1</td></tr>
<tr><td></td><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>+ 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></td><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**