
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 $\geq 6.00 \text{ cm}^3$ 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-axis</i> and volume on <i>x-axis</i> . 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 $4 \times \text{ans (i)}$	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 (NH ₄) ₂ Fe(SO ₄) ₂ FA 5 is KAl(SO ₄) ₂ FA 6 is Na ₂ SO ₃ FA 7 is H ₂ SO ₄ FA 8 is NaNO ₂																														
2(a)(i)	<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">+ NH₃</td><td>green ppt</td><td>white ppt</td><td>1</td></tr><tr><td>and turning brown (in air) in either alkali test</td><td></td><td></td></tr><tr><td></td><td>insoluble in excess</td><td>insoluble in excess</td><td>1</td></tr></table>	test	observation		mark	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	white ppt	1	and turning brown (in air) in either alkali test				insoluble in excess	insoluble in excess	1	5
test	observation		mark																											
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	insoluble in excess	insoluble in excess	1																											

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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