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**CHEMISTRY**

**9701/34**

Paper 3 Advanced Practical Skills 2

**October/November 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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Question	Answer	Marks
1(a)	<b>I</b> 5 (or more) experiments completed <b>and</b> Table to show Volume of <b>FB 1</b> , Volume of water, Time and Rate	1
	<b>II</b> Correct units for all data Volume: in $\text{cm}^3$ or $/\text{cm}^3$ or $(\text{cm}^3)$ or $\text{cm}^3$ by each volume Time: $/\text{s}$ or $(\text{s})$ or $\text{s}$ by each time ( <i>not sec or seconds but allow 'in seconds'</i> ) Rate: $/\text{s}^{-1}$ or $(\text{s}^{-1})$ or $\text{s}^{-1}$ by each rate	1
	<b>III</b> All times recorded to nearest second (minimum of 3 times)	1
	<b>IV</b> Two additional experiments with volume <b>FB 1</b> not less than $10\text{ cm}^3$ , not more than $40\text{ cm}^3$ and no volume $\leq 2\text{ cm}^3$ close to another volume.	1
	<b>V</b> Volumes of water chosen so that <b>FB1</b> + water = $40\text{ cm}^3$ for additional experiments carried out.	1
	<b>VI</b> Correctly calculates rate for all experiments and shown to 2 – 4 sf.	1
	<b>VII</b> Award if all candidate's times increase with decrease in volume of <b>FB 1</b> .	1
	<b>VIII</b> Award if candidate's time to nearest second for Experiment 2 is within 10% of the supervisor's result	1
	<b>IX</b> Award if candidate's (time for <b>FB 1</b> = 20)/(time <b>FB 1</b> = 40) is between 1.90 and 2.40	1
	<b>X</b> Award if candidate's (time for <b>FB 1</b> = 20)/(time <b>FB 1</b> = 40) is between 2.00 and 2.30	1
1(b)	Linear scales that cover more than half the space in both directions <b>and</b> axes labelled correctly (allow the correct unit as the label)	1
	Points plotted correctly. Points must be within half a small square of the correct position, if the point should be on a line it must be on the line and if it should not be on the line it must not be so.	1
	Line of best fit drawn which ignores anomalous results identified by the candidate	1

Question	Answer	Marks
1(c)	Correct line drawn within 1 small square (horizontal line must be shown and some mark shown at 8).	1
	Correctly calculates = $1000/\text{rate}$ (to 2 – 4 sf or a whole number of seconds).	1
1(d)(i)	The print (on the insert) would take longer to disappear	1
	The liquid would be less deep	1
1(d)(ii)	The reaction time would be longer/reaction is slower/rate is less	1
	Accuracy improved because the percentage error in time less <b>OR</b> Accuracy not improved because more difficult to judge when print disappeared	1
1(e)	Expression % = $(1/\text{Reaction time Experiment 1}) \times 100$ <b>OR</b> $(0.5/\text{Reaction time Experiment 1}) \times 100$	1
1(f)	Keep volume thiosulfate/ <b>FB1</b> constant and vary volume acid/ <b>FB 2</b>	1
	Keep total volume <b>FB 2</b> + water constant	1
	Keep temperature constant/use same (shape) reaction vessel/use same printed sheet/carry out 5 (or more) expts with different volumes HCl/ <b>FB 2</b>	1
1(g)(i)	Straight line through origin (with positive gradient)	1
1(g)(ii)	Straight horizontal line	1

Question	Answer			Marks																
<b>FB 3</b> is NaOH(aq), <b>FB 4</b> is NH <sub>3</sub> (aq), <b>FB 5</b> is MgCl <sub>2</sub> (aq), <b>FB 6</b> is CuCl <sub>2</sub> (aq), <b>FB 7</b> is Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> (aq), <b>FB 8</b> is Na <sub>2</sub> S <sub>2</sub> O <sub>8</sub> (aq), <b>FB 9</b> is Na <sub>2</sub> SO <sub>4</sub> (aq).																				
2(a)(i)	<table border="1"> <thead> <tr> <th></th> <th><b>FB 4</b></th> <th><b>FB 5</b></th> <th><b>FB 6</b></th> </tr> </thead> <tbody> <tr> <td><b>FB 3</b></td> <td>No reaction / no change / solution remains colourless</td> <td>White ppt</td> <td>(Pale / light) blue ppt</td> </tr> <tr> <td><b>FB 4</b></td> <td></td> <td>White ppt</td> <td>Dark / deep blue solution / (pale/light) blue ppt</td> </tr> <tr> <td><b>FB 5</b></td> <td></td> <td></td> <td>No reaction / no change</td> </tr> </tbody> </table> <p>6 correct boxes = 3 marks, 4 or 5 correct boxes = 2 marks, 2 or 3 correct boxes = 1 mark.</p>				<b>FB 4</b>	<b>FB 5</b>	<b>FB 6</b>	<b>FB 3</b>	No reaction / no change / solution remains colourless	White ppt	(Pale / light) blue ppt	<b>FB 4</b>		White ppt	Dark / deep blue solution / (pale/light) blue ppt	<b>FB 5</b>			No reaction / no change	<b>3</b>
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2(a)(ii)	OH <sup>-</sup> / hydroxide			<b>1</b>																
2(a)(iii)	Named indicator eg red litmus ('red' could be in the results) <b>or</b> formula / named (aqueous) salt that gives insoluble hydroxides			<b>1</b>																
	Positive result for alkali			<b>1</b>																
2(a)(iv)	Two of Mg <sup>2+</sup> , Zn <sup>2+</sup> , Al <sup>3+</sup> , Ca <sup>2+</sup> , Ba <sup>2+</sup>			<b>1</b>																
2(a)(v)	Test to distinguish ions in <b>(iv)</b>			<b>1</b>																
	Result of test <b>and</b> appropriate conclusion			<b>1</b>																

Question	Answer				Marks
2(b)(i)		<b>FB 7</b>	<b>FB 8</b>	<b>FB 9</b>	<b>3</b>
	KI	No reaction / no change / solution remains colourless	Yellow / brown colour	No reaction / no change / solution remains colourless	
	starch		then blue-black / black / dark blue		
	I <sub>2</sub>	Decolourises	No reaction	No reaction / (stays) yellow / brown	
	Ba <sup>2+</sup>	No reaction no change / solution remains colourless / no ppt	(ignore responses here)	White ppt	
9 correct boxes = 3 marks 6, 7 or 8 correct boxes = 2 marks 3, 4 or 5 correct boxes = 1 mark					

Question	Answer	Marks
2(b)(ii)	$\text{SO}_4^{2-}$ or $\text{SO}_3^{2-}$ (both needed)	1
2(b)(iii)	Add suitable named acid to <b>FB 9</b> and $\text{Ba}(\text{NO}_3)_2 / \text{BaCl}_2$ ppt <b>or</b> Add (acidified aqueous) potassium manganate(VII) / $\text{KMnO}_4$ to <b>FB 9</b> <b>or</b> Add named acid and test (any) gas evolved with (acidified aqueous) potassium manganate(VII)	1
	Anion present: $\text{SO}_4^{2-}$ <b>and</b> No effect of acid on (white) ppt <b>or</b> (Solution) turns purple / purple not decolourised <b>or</b> No bubbles / manganate(VII) paper remains purple / blue litmus remains blue	1