

**CHEMISTRY****9701/34**

Paper 3 Advanced Practical Skills 2

**October/November 2017**

MARK SCHEME

Maximum Mark: 40

**Published**

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This document consists of **6** printed pages.

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" data-bbox="342 284 1326 691"> <thead> <tr> <th data-bbox="342 284 454 336"></th> <th data-bbox="454 284 745 336">FB 4</th> <th data-bbox="745 284 1037 336">FB 5</th> <th data-bbox="1037 284 1326 336">FB 6</th> </tr> </thead> <tbody> <tr> <td data-bbox="342 336 454 453"><b>FB 3</b></td> <td data-bbox="454 336 745 453">No reaction / no change / solution remains colourless</td> <td data-bbox="745 336 1037 453">White ppt</td> <td data-bbox="1037 336 1326 453">(Pale / light) blue ppt</td> </tr> <tr> <td data-bbox="342 453 454 569"><b>FB 4</b></td> <td data-bbox="454 453 745 569"></td> <td data-bbox="745 453 1037 569">White ppt</td> <td data-bbox="1037 453 1326 569">Dark / deep blue solution / (pale/light) blue ppt</td> </tr> <tr> <td data-bbox="342 569 454 691"><b>FB 5</b></td> <td data-bbox="454 569 745 691"></td> <td data-bbox="745 569 1037 691"></td> <td data-bbox="1037 569 1326 691">No reaction / no change</td> </tr> </tbody> </table> <p data-bbox="342 727 1496 759">6 correct boxes = 3 marks, 4 or 5 correct boxes = 2 marks, 2 or 3 correct boxes = 1 mark.</p>				FB 4	FB 5	FB 6	<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>
	FB 4	FB 5	FB 6																	
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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