Cambridge International AS & A Level

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Cambridge International Advanced Subsidiary and Advanced Level

CHEMISTRY **9701/34**

Paper 3 Advanced Practical Skills 2 **October/November 2017**

MARK SCHEME

Maximum Mark: 40

Published

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Question	Answer	Marks
1(a)	**I** 5 (or more) experiments completed **and** Table to show Volume of **FB 1**, Volume of water, Time and Rate	**1**
	II Correct units for all data Volume: in cm^3 or / cm^3 or (cm^3) or cm^3 by each volume Time: / s or (s) or s by each time (*not sec or seconds but allow 'in seconds')* Rate: / s^{-1} or (s^{-1}) or s^{-1} by each rate	**1**
	III All times recorded to nearest second (minimum of 3 times)	**1**
	IV Two additional experiments with volume **FB 1** not less than 10 cm^3, not more than 40 cm^3 and no volume $\leqslant$ 2 cm^3 close to another volume.	**1**
	V Volumes of water chosen so that **FB1** + water = 40 cm^3 for additional experiments carried out.	**1**
	VI Correctly calculates rate for all experiments and shown to 2 – 4 sf.	**1**
	VII Award if all candidate's times increase with decrease in volume of **FB 1.**	**1**
	VIII Award if candidate's time to nearest second for Experiment 2 is within 10% of the supervisor's result	**1**
	IX Award if candidate's (time for **FB 1** = 20) / (time **FB 1**= 40) is between 1.90 and 2.40	**1**
	X Award if candidate's (time for **FB 1** = 20) / (time **FB 1**= 40) is between 2.00 and 2.30	**1**
1(b)	Linear scales that cover more than half the space in both directions **and** 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**

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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 / 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 **OR** Accuracy not improved because more difficult to judge when print disappeared	**1**
1(e)	Expression % = (1 / Reaction time **Experiment 1**) × 100 **OR** (0.5 / Reaction time **Experiment 1**) × 100	**1**
1(f)	Keep volume thiosulfate / **FB1** constant and vary volume acid / **FB 2**	**1**
	Keep total volume **FB 2** + 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 / **FB 2**	**1**
1(g)(i)	Straight line through origin (with positive gradient)	**1**
1(g)(ii)	Straight horizontal line	**1**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td colspan="3">FB 3 is NaOH(aq), FB 4 is NH_3(aq), FB 5 is $MgCl_2$(aq), FB 6 is $CuCl_2$(aq), FB 7 is $Na_2S_2O_3$(aq), FB 8 is $Na_2S_2O_8$(aq), FB 9 is Na_2SO_4(aq).</td></tr>
<tr><td>2(a)(i)</td><td>
<table>
<tr><th></th><th>FB 4</th><th>FB 5</th><th>FB 6</th></tr>
<tr><td>FB 3</td><td>No reaction / no change / solution remains colourless</td><td>White ppt</td><td>(Pale / light) blue ppt</td></tr>
<tr><td>FB 4</td><td></td><td>White ppt</td><td>Dark / deep blue solution / (pale/light) blue ppt</td></tr>
<tr><td>FB 5</td><td></td><td></td><td>No reaction / no change</td></tr>
</table>
6 correct boxes = 3 marks, 4 or 5 correct boxes = 2 marks, 2 or 3 correct boxes = 1 mark.
</td><td>3</td></tr>
<tr><td>2(a)(ii)</td><td>OH^- / hydroxide</td><td>1</td></tr>
<tr><td>2(a)(iii)</td><td>Named indicator
eg red litmus (‘red’ could be in the results)
or
formula / named (aqueous) salt that gives insoluble hydroxides</td><td>1</td></tr>
<tr><td></td><td>Positive result for alkali</td><td>1</td></tr>
<tr><td>2(a)(iv)</td><td>Two of Mg^{2+}, Zn^{2+}, Al^{3+}, Ca^{2+}, Ba^{2+}</td><td>1</td></tr>
<tr><td>2(a)(v)</td><td>Test to distinguish ions in (iv)</td><td>1</td></tr>
<tr><td></td><td>Result of test
and
appropriate conclusion</td><td>1</td></tr>
</table>

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>2(b)(i)</td><td>
<table>
<tr><th></th><th>FB 7</th><th>FB 8</th><th>FB 9</th></tr>
<tr><td>KI</td><td rowspan="2">No reaction / no change / solution remains colourless</td><td>Yellow / brown colour</td><td rowspan="2">No reaction / no change / solution remains colourless</td></tr>
<tr><td>starch</td><td>then blue-black / black / dark blue</td></tr>
<tr><td>I_2</td><td>Decolourises</td><td>No reaction</td><td>No reaction / (stays) yellow / brown</td></tr>
<tr><td>Ba^{2+}</td><td>No reaction no change / solution remains colourless / no ppt</td><td>(ignore responses here)</td><td>White ppt</td></tr>
</table>
9 correct boxes = 3 marks
6, 7 or 8 correct boxes = 2 marks
3, 4 or 5 correct boxes = 1 mark
</td><td>3</td></tr>
</table>

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Question	Answer	Marks
2(b)(ii)	SO_4^{2-} or SO_3^{2-} (both needed)	**1**
2(b)(iii)	Add suitable named acid to **FB 9** and $Ba(NO_3)_2$ / $BaCl_2$ ppt **or** Add (acidified aqueous) potassium manganate(VII) / $KMnO_4$ to **FB 9** **or** Add named acid and test (any) gas evolved with (acidified aqueous) potassium manganate(VII)	**1**
	Anion present: SO_4^{2-} **and** No effect of acid on (white) ppt **or** (Solution) turns purple / purple not decolourised **or** No bubbles / manganate(VII) paper remains purple / blue litmus remains blue	**1**

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