Cambridge International AS & A Level

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CHEMISTRY **9701/34**

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

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**

<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>

<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>

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**