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**CHEMISTRY**

**9701/53**

Paper 5 Planning, Analysis and Evaluation

**October/November 2018**

MARK SCHEME

Maximum Mark: 30

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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.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

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This document consists of **7** printed pages.

**PUBLISHED****Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

**GENERIC MARKING PRINCIPLE 1:**

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

**GENERIC MARKING PRINCIPLE 2:**

Marks awarded are always **whole marks** (not half marks, or other fractions).

**GENERIC MARKING PRINCIPLE 3:**

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

**GENERIC MARKING PRINCIPLE 4:**

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

**GENERIC MARKING PRINCIPLE 5:**

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

**GENERIC MARKING PRINCIPLE 6:**

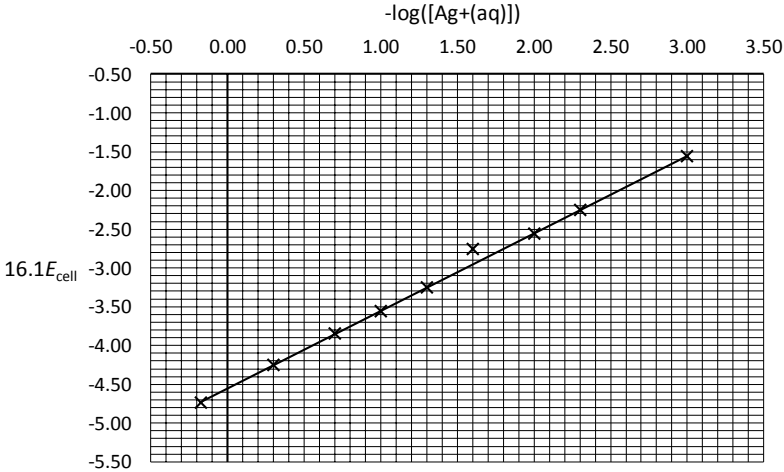
Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

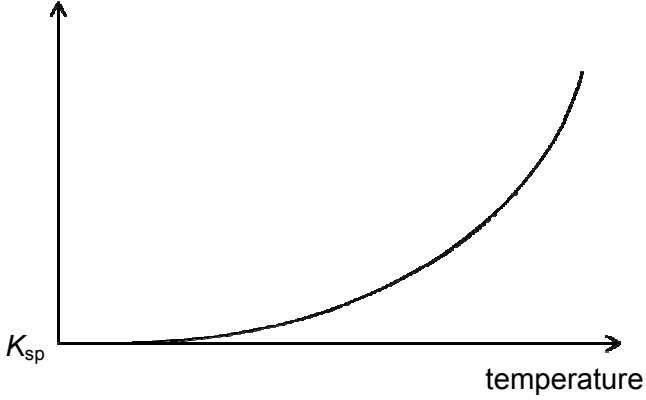
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Question	Answer	Marks
1(a)(i)	To prevent reaction with water/hydrolysis (if wet)	1
1(a)(ii)	<b>M1</b> solid / ppt NaBr forms <b>M2</b> Equilibrium (position) lies (well) to the right / equilibrium position shifts to RHS	2
1(b)	<b>M1</b> No naked flames <b>AND</b> (highly) flammable <b>M2</b> Perform experiment in fume cupboard <b>AND</b> irritant to respiratory system / may cause dizziness / drowsiness	2
1(c)(i)	mass of NaI = $0.50 \times \frac{150}{1000} \times 149.9$ = 11.2 g mass of propanone = $150 \times 0.79$ = 118.5 g	2
1(c)(ii)	<b>M1</b> volume of NaI varied <b>M2</b> CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> Br volume (2.0 cm <sup>3</sup> ) <b>AND</b> total volume constant at 42.0 cm <sup>3</sup> <b>AND</b> table is complete	2
1(c)(iii)	dependent variable = time	1
1(c)(iv)	rate = 1 / time or 1 / t	1
1(c)(v)	<b>M1</b> (Recording / determining) the time when opaque / cross disappears <b>M2</b> dilute the solution (to give a longer time)	2
1(d)	No <b>and</b> because rate of S <sub>N</sub> 1 is only dependent on (concentration) of the organic compound	1

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Question	Answer	Marks																				
2(a)(i)	Temperature / thermostatically controlled water bath	1																				
2(a)(ii)	water may evaporate / $[\text{Ag}^+]$ will change	1																				
2(b)	<table border="1" data-bbox="333 384 788 914"> <thead> <tr> <th data-bbox="333 384 562 448"><math>-\log [\text{Ag}^+(\text{aq})]</math></th> <th data-bbox="562 384 788 448"><math>16.1E_{\text{cell}} / \text{V}</math></th> </tr> </thead> <tbody> <tr> <td data-bbox="333 448 562 504">3.00</td> <td data-bbox="562 448 788 504">-1.56</td> </tr> <tr> <td data-bbox="333 504 562 560">2.30</td> <td data-bbox="562 504 788 560">-2.25</td> </tr> <tr> <td data-bbox="333 560 562 616">2.00</td> <td data-bbox="562 560 788 616">-2.56</td> </tr> <tr> <td data-bbox="333 616 562 671">1.60</td> <td data-bbox="562 616 788 671">-2.75</td> </tr> <tr> <td data-bbox="333 671 562 727">1.30</td> <td data-bbox="562 671 788 727">-3.25</td> </tr> <tr> <td data-bbox="333 727 562 783">1.00</td> <td data-bbox="562 727 788 783">-3.56</td> </tr> <tr> <td data-bbox="333 783 562 839">0.70</td> <td data-bbox="562 783 788 839">-3.85</td> </tr> <tr> <td data-bbox="333 839 562 895">0.30</td> <td data-bbox="562 839 788 895">-4.25</td> </tr> <tr> <td data-bbox="333 895 562 951">-0.18</td> <td data-bbox="562 895 788 951">-4.73</td> </tr> </tbody> </table> <p data-bbox="333 970 748 1007"><b>M1</b> <math>\log [\text{Ag}^+]</math> data correct to 2dp</p> <p data-bbox="333 1023 741 1059"><b>M2</b> <math>16.1E_{\text{cell}}</math> data correct to 2dp</p>	$-\log [\text{Ag}^+(\text{aq})]$	$16.1E_{\text{cell}} / \text{V}$	3.00	-1.56	2.30	-2.25	2.00	-2.56	1.60	-2.75	1.30	-3.25	1.00	-3.56	0.70	-3.85	0.30	-4.25	-0.18	-4.73	2
$-\log [\text{Ag}^+(\text{aq})]$	$16.1E_{\text{cell}} / \text{V}$																					
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Question	Answer	Marks
2(c)(i)	 <p data-bbox="331 735 784 810"><b>M1</b> All nine points plotted correctly <b>M2</b> Best-fit <b>straight</b> line drawn</p>	<b>2</b>
2(c)(ii)	<p data-bbox="331 858 743 890"><b>M1</b> Point at (1.60, -2.75) circled</p> <p data-bbox="331 935 1218 967"><b>M2</b> Not concentrated enough / more dilute / less than <math>0.025 \text{ mol dm}^{-3}</math></p>	<b>2</b>
2(c)(iii)	intercept at $-\log [\text{Ag}^+(\text{aq})] = 0$ read and recorded correctly	<b>1</b>
2(d)(i)	12.5 / 12.50 $\text{cm}^3$	<b>1</b>
2(d)(ii)	burette	<b>1</b>
2(e)(i)	<p data-bbox="331 1257 815 1295"><b>M1</b> <math>K_{\text{sp}} = (2.82 \times 10^{-5})^2 = 7.95 \times 10^{-10}</math></p> <p data-bbox="331 1305 425 1337"><b>M2</b> 3sf</p>	<b>2</b>

Question	Answer	Marks
2(e)(ii)	 <p>Temperature labelled on the x-axis and <math>K_{sp}</math> on the y-axis <b>AND</b> (curved) line upwards</p>	<b>1</b>
2(f)	<p><b>M1</b> Potassium chloride <b>AND / OR</b> sodium chloride</p> <p><b>M2</b> Chloride ions would form a precipitate with <math>Ag^+</math> ions / reduce <math>[Ag^+]</math> concentration</p>	<b>1</b>