Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

CHEMISTRY **9701/52**

Paper 5 Planning, Analysis and Evaluation **May/June 2018**

MARK SCHEME

Maximum Mark: 30

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.

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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.

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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)	Wear gloves	**1**
1(b)	(Remains) colourless **AND** (Becomes) red	**1**
1(c)(i)	$n(SO_4^{2-}) = 0.100 \times 100 = 0.01(00)$ mol Mass $K_2SO_4 = 0.01(00) \times 174.3 = 1.74$ g	**1**
1(c)(ii)	Dissolve mass from **1(c)(i)** of K_2SO_4 in (a suitable container with) (distilled water) (in less than 100 cm^3 of water)	**1**
	(Transfer / add to) a (100 cm^3) volumetric flask; make to mark with (distilled water) Distilled/deionised water must be mentioned at least once for the award of both marks	**1**
1(d)	$0.1 \times \frac{0.05}{1000} = 5 \times 10^{-6}$ mol	**1**
1(e)(i)	Volume 0.100 mol dm^3 $K_2SO_4 = 50.0 \times \frac{0.01(00)}{0.1(00)} = 5.0(0)$ cm^3	**1**
1(e)(ii)	Burette	**1**
1(f)	The percentage error in using small mass is larger, therefore not accurate	**1**
1(g)(i)	The higher the negative charge the less the amount required	**1**
1(g)(ii)	Charge on cation	**1**
1(g)(iii)	$AlCl_3$	**1**
	It has a positive ion **AND** +3 is the highest charge	**1**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)</td><td>More energy / heat needed to increase the vapour pressure to atmospheric pressure.</td><td>1</td></tr>
<tr><td>2(b)</td><td>Arrow at bottom inlet of the condenser only</td><td>1</td></tr>
<tr><td>2(c)</td><td>Not high enough resolution</td><td>1</td></tr>
<tr><td>2(d)</td><td>To ensure volume / amount / mass of water is constant by minimising / preventing loss of water vapour</td><td>1</td></tr>
<tr><td>2(e)</td><td>The pressure in the laboratory is lower than at sea level / 101 kPa (atm) / room (temperature and) pressure / standard pressure</td><td>1</td></tr>
<tr><td rowspan="4">2(f)(i)</td><td>
<table>
<tr><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th></tr>
<tr><td>1.22</td><td>99.53</td><td>0.00678</td><td>0.0904</td><td>0.05</td></tr>
<tr><td>2.54</td><td>99.58</td><td>0.0141</td><td>0.188</td><td>0.10</td></tr>
<tr><td>3.46</td><td>99.61</td><td>0.0192</td><td>0.256</td><td>0.13</td></tr>
<tr><td>4.37</td><td>99.65</td><td>0.0243</td><td>0.324</td><td>0.17</td></tr>
<tr><td>5.01</td><td>99.67</td><td>0.0278</td><td>0.371</td><td>0.19</td></tr>
<tr><td>5.93</td><td>99.70</td><td>0.0329</td><td>0.439</td><td>0.22</td></tr>
<tr><td>7.01</td><td>99.72</td><td>0.0389</td><td>0.519</td><td>0.24</td></tr>
<tr><td>7.95</td><td>99.78</td><td>0.0442</td><td>0.589</td><td>0.30</td></tr>
<tr><td>8.78</td><td>99.81</td><td>0.0488</td><td>0.651</td><td>0.33</td></tr>
</table>
</td><td></td></tr>
<tr><td>Column values for C and D correctly calculated</td><td>1</td></tr>
<tr><td>3 significant figures in C and D</td><td>1</td></tr>
<tr><td>values in E correctly calculated to 2 decimal places</td><td>1</td></tr>
</table>

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Question	Answer	Marks
2(f)(ii)	Candidate's (calculated) points correctly plotted from **2(f)(i)**	**1**
	Straight line of best fit	**1**
2(f)(iii)	Point at $\Delta T = 0.24°C$	**1**
2(g)	Two sets of co-ordinates shown.	**1**
	Gradient calculation to 3 sf	**1**
	Units: °C kg mol^{-1}	**1**
2(h)(i)	K_b lower **AND** Fewer moles of sucrose than expected so lower ΔT than expected	**1**
2(h)(ii)	Tap water contains dissolved solids / dissolved ions which affect boiling point	**1**
2(h)(iii)	There are two moles of ions / particles per mole of sodium chloride	**1**

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