
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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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.

PUBLISHED**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)	$n(\text{SO}_4^{2-}) = 0.100 \times 100 = 0.01(00)$ mol Mass $\text{K}_2\text{SO}_4 = 0.01(00) \times 174.3 = 1.74$ 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 $0.100 \text{ mol dm}^3 \text{ K}_2\text{SO}_4 = 50.0 \times \frac{0.01(00)}{0.1(00)} = 5.0(0)$ 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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Question	Answer	Marks																																																		
2(a)	More energy / heat needed to increase the vapour pressure to atmospheric pressure.	1																																																		
2(b)	Arrow at bottom inlet of the condenser only	1																																																		
2(c)	Not high enough resolution	1																																																		
2(d)	To ensure volume / amount / mass of water is constant by minimising / preventing loss of water vapour	1																																																		
2(e)	The pressure in the laboratory is lower than at sea level / 101 kPa (atm) / room (temperature and) pressure / standard pressure	1																																																		
2(f)(i)	<table border="1" data-bbox="797 523 1476 1179"> <thead> <tr> <th data-bbox="797 523 900 588">A</th> <th data-bbox="900 523 1041 588">B</th> <th data-bbox="1041 523 1182 588">C</th> <th data-bbox="1182 523 1361 588">D</th> <th data-bbox="1361 523 1476 588">E</th> </tr> </thead> <tbody> <tr> <td data-bbox="797 588 900 647">1.22</td> <td data-bbox="900 588 1041 647">99.53</td> <td data-bbox="1041 588 1182 647">0.00678</td> <td data-bbox="1182 588 1361 647">0.0904</td> <td data-bbox="1361 588 1476 647">0.05</td> </tr> <tr> <td data-bbox="797 647 900 707">2.54</td> <td data-bbox="900 647 1041 707">99.58</td> <td data-bbox="1041 647 1182 707">0.0141</td> <td data-bbox="1182 647 1361 707">0.188</td> <td data-bbox="1361 647 1476 707">0.10</td> </tr> <tr> <td data-bbox="797 707 900 766">3.46</td> <td data-bbox="900 707 1041 766">99.61</td> <td data-bbox="1041 707 1182 766">0.0192</td> <td data-bbox="1182 707 1361 766">0.256</td> <td data-bbox="1361 707 1476 766">0.13</td> </tr> <tr> <td data-bbox="797 766 900 825">4.37</td> <td data-bbox="900 766 1041 825">99.65</td> <td data-bbox="1041 766 1182 825">0.0243</td> <td data-bbox="1182 766 1361 825">0.324</td> <td data-bbox="1361 766 1476 825">0.17</td> </tr> <tr> <td data-bbox="797 825 900 884">5.01</td> <td data-bbox="900 825 1041 884">99.67</td> <td data-bbox="1041 825 1182 884">0.0278</td> <td data-bbox="1182 825 1361 884">0.371</td> <td data-bbox="1361 825 1476 884">0.19</td> </tr> <tr> <td data-bbox="797 884 900 943">5.93</td> <td data-bbox="900 884 1041 943">99.70</td> <td data-bbox="1041 884 1182 943">0.0329</td> <td data-bbox="1182 884 1361 943">0.439</td> <td data-bbox="1361 884 1476 943">0.22</td> </tr> <tr> <td data-bbox="797 943 900 1002">7.01</td> <td data-bbox="900 943 1041 1002">99.72</td> <td data-bbox="1041 943 1182 1002">0.0389</td> <td data-bbox="1182 943 1361 1002">0.519</td> <td data-bbox="1361 943 1476 1002">0.24</td> </tr> <tr> <td data-bbox="797 1002 900 1061">7.95</td> <td data-bbox="900 1002 1041 1061">99.78</td> <td data-bbox="1041 1002 1182 1061">0.0442</td> <td data-bbox="1182 1002 1361 1061">0.589</td> <td data-bbox="1361 1002 1476 1061">0.30</td> </tr> <tr> <td data-bbox="797 1061 900 1120">8.78</td> <td data-bbox="900 1061 1041 1120">99.81</td> <td data-bbox="1041 1061 1182 1120">0.0488</td> <td data-bbox="1182 1061 1361 1120">0.651</td> <td data-bbox="1361 1061 1476 1120">0.33</td> </tr> </tbody> </table>	A	B	C	D	E	1.22	99.53	0.00678	0.0904	0.05	2.54	99.58	0.0141	0.188	0.10	3.46	99.61	0.0192	0.256	0.13	4.37	99.65	0.0243	0.324	0.17	5.01	99.67	0.0278	0.371	0.19	5.93	99.70	0.0329	0.439	0.22	7.01	99.72	0.0389	0.519	0.24	7.95	99.78	0.0442	0.589	0.30	8.78	99.81	0.0488	0.651	0.33	
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Column values for C and D correctly calculated		1																																																		
3 significant figures in C and D		1																																																		
values in E correctly calculated to 2 decimal places		1																																																		

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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 $\Delta T = 0.24^\circ\text{C}$	1
2(g)	Two sets of co-ordinates shown.	1
	Gradient calculation to 3 sf	1
	Units: $^\circ\text{C kg mol}^{-1}$	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