Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

CHEMISTRY **9701/36**

Paper 3 Advanced Practical Skills 2 **October/November 2018**

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.

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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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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Rounding errors and transcription errors are penalised only once in the paper.

Question	Answer	Marks
1(a)	**I** Constructs a table for results for 5 experiments and 4 columns.	**1**
	II Appropriate headings and units for all recorded data given. Volumes in cm^3 or / cm^3 or (cm^3). Time in seconds or / s or (s). Units for rate given as s^{-1}	**1**
	III All times recorded to the nearest second **and** volumes of **FB 1** and water to at least 1 decimal place.	**1**
	IV Three **additional** volumes chosen with intervals not less than 2.00 cm^3 **AND** No experiment with **FB 1** = 15.00 cm^3 **AND** all volumes of **FB 1** ≥ 5.00 cm^3 **AND** at least one experiment between 5 cm^3 and 10 cm^3	**1**
	V In all additional experiments water is added to make the same total volume.	**1**
	VI All rates correctly calculated using 1000 / time **AND** 1 or 2 decimal place	**1**
	VII + **VIII** Compare time for 20.00 cm^3 of **FB 1** with that of supervisor. Award **VII** for within 20% of supervisor rounded to nearest s. Award **VII** + **VIII** for within 10% of supervisor rounded to nearest s.	**2**
	Examiner calculates supervisor's ratio time expt 2 / time expt 1 to 2 dp. Calculate candidate t_2 / t_1 to 2 dp	
	IX + X Compare ratio of time for 10.00 cm^3 **FB 1** / time for 20.00 cm^3 **FB 1** with that of supervisor. Award **IX** for within 0.20. Award **IX + X** for within 0.10.	**2**

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Question	Answer	Marks
1(b)	**I** Rate on *y-axis* and volume on *x-axis*. Axes clearly labelled (labels or units).	**1**
	II Linear scales including origin; scale chosen so that plotted points and the origin use more than half of each axis	**1**
	III All recorded points plotted correctly to within half a small square and in the correct square. Points that should be plotted on lines must be on lines, points that should not be on lines must not be on lines. Do not award for crosses or blobs more than half a small square thick.	**1**
	IV Draws a line of best fit. This may be a straight line or smooth curve. Points must be balanced and line cannot be improved by rotation.	**1**
1(c)	Straight line: Rate is proportional to volume of **FB 1** **OR** Curved line: Rate is proportional to volume of **FB 1**	**1**
	Rate is **directly proportional** to volume of **FB 1 because** straight line goes through origin / **OR** Rate is proportional to volume of **FB 1** as straight line but **not** through origin. **OR** for curved line: It is not directly proportional because not a straight line	**1**
1(d)(i)	Reads rate from graph to the nearest small square using **vertical** and **horizontal** construction lines and some evidence of its use in the calculation.	**1**
	Correctly calculates time from candidate's value for *y*-axis intercept to 2–4 sf	**1**
1(d)(ii)	**Correctly uses** % difference to 2–4 significant figures	**1**

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Question	Answer	Marks
1(e)	Uses 20 cm^3 of **FB 2** and records time less than Experiment 2 (with 10 cm^3 **FB 1**).	**1**
	Volumes: **FB 1** = 10 cm^3 **FB 2** = 20 cm^3 **FB 3** = 20 cm^3 **FB 4** = 10 cm^3	**1**
1(f)(i)	Moles Fe^{3+} = 0.001(0) **or** 0.05 × 20/1000 Moles I_2 = 0.0005(0)	**1** **1**
1(f)(ii)	moles I_2 in **(i)** × 2/0.035 Concentration for correct n(I_2) = 0.029 / 0.0286 / 0.02857 mol dm^{-3} **and** answer to 2–4 sf	**1**

Question	Answer	Marks
	(**FB 1** = Fe^{3+}; **FB 5** = $S_2O_3^{2-}$;) **FB 6** = KBr(aq); **FB 7** = $CuSO_4$(aq); **FB 8** = $Al_2(SO_4)_3$	
2(a)(i)	(turns) purple **and** turns colourless (solution) / white or (pale) yellow ppt (on standing)	**1**
	green / black / brown ppt on adding NaOH	**1**
	white ppt	**1**
2(a)(ii)	One of: Yes, as the Fe^{3+} does not all react with I^- Yes, as all the $S_2O_3^{2-}$ does not react with I_2 Yes, as less $S_2O_3^{2-}$ (present) to react with I_2 No, as concentration of $S_2O_3^{2-}$ is much lower in Q1 than in Q2	**1**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(b)(i)</td><td>
<table>
<tr><th>test</th><th>observation</th></tr>
<tr><td>+ $Ag^+(aq)$</td><td>cream ppt ●</td></tr>
<tr><td>+ $NH_3(aq)$</td><td>ppt insoluble / partially soluble / no reaction / no (visible) change ●</td></tr>
<tr><td>+ $Ag^+(aq)$</td><td>cream ppt ●</td></tr>
<tr><td>+ FB 5</td><td>ppt soluble / (colourless) solution formed ●</td></tr>
</table>
Two ● = 1 mark
</td><td>2</td></tr>
<tr><td>2(b)(ii)</td><td>Halide in FB 6 is Br^- / bromide</td><td>1</td></tr>
<tr><td>2(c)(i)</td><td>(solution) turns brown
OR
white / off-white / brown ppt
not yellow ppt nor yellow solution

AND
black / blue-black / dark blue on addition of starch</td><td>1</td></tr>
<tr><td></td><td>Final colour and either initial colour or solution must be given.
Solution turns from blue to pale yellow</td><td>1</td></tr>
<tr><td></td><td>no (colour) change / no reaction (on addition of FB 2 or of starch)</td><td>1</td></tr>
<tr><td>2(c)(ii)</td><td>I_2 OR CuI</td><td>1</td></tr>
</table>

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Question	Answer	Marks
2(d)(i)	NaOH **and** NH_3	**1**
	$BaCl_2$ / $Ba(NO_3)_2$ **AND** HCl / HNO_3 **OR** acidified (aqueous) $KMnO_4$ **OR** named mineral acid **AND** test any gas with $KMnO_4$	**1**
	With NaOH white ppt and sol in excess **AND** with NH_3 white ppt and insol in excess	**1**
	With $BaCl_2$ / $Ba(NO_3)_2$ white ppt **AND** insoluble in acid **OR** (with $KMnO_4$) no change / no reaction **AND** solution remains purple **OR** dichromate – no change **AND** solution remains orange **OR** (with named acid) no gas evolved / no change / no reaction **AND** $KMnO_4$ (paper) stays purple	**1**
2(d)(ii)	**FB 8** is $Al_2(SO_4)_3$	**1**

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