Cambridge Assessment International Education
Cambridge Ordinary Level

CHEMISTRY **5070/41**

Paper 4 Alternative to Practical **October/November 2018**

MARK SCHEME

Maximum Mark: 60

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	**P**: conical flask (1) **Q**: pipette (1)	**2**

Question	Answer	Marks
2(a)	**A**: X (1) **B**: Y (1)	**2**
2(b)(i)	because it's easier to tell when it (**Z**) is full / **Y** is only suitable for gases less dense than air / (**Y** is not suitable because) the gas (**C**) is more dense than air / the gas would travel downwards in **Y** (and gas jar would not be filled)	**1**
2(b)(ii)	using **X** it is not possible to tell when the gas jar is full / because the gas (**C**) is colourless / because it's easier to tell when it (**Z**) is full	**1**

Question	Answer	Marks
3(a)	sulfur dioxide or gas or SO_2 is toxic or poisonous	**1**
3(b)(i)	temperature	**1**
3(b)(ii)	use (thermostatically controlled) water bath	**1**
3(c)(i)	missing volume of dilute hydrochloric acid / cm^3 = 5 (1) missing volume of water / cm^3 = 5 (1)	**2**
3(c)(ii)	(experiment) 5	**1**
3(c)(iii)	as concentration increases time decreases (1) rate increases as time decreases (1)	**2**
3(d)(i)	$10 \times 0.5 / 1000 = 0.005 / 5 \times 10^{-3}$ (moles)	**1**
3(d)(ii)	50 (cm^3)	**1**

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Question	Answer	Marks
3(d)(iii)	(10 / 50 × 0.50 =) 0.10 (mol / dm^3)	**1**
3(e)	acidified potassium manganate(VII) (1) colourless / decolourised (1)	**2**
3(f)	add any dilute acid and warm (1) sulfur dioxide evolved (1) **OR** aqueous barium nitrate (1) a white precipitate forms which dissolves in acid (1)	**2**

Question	Answer	Marks
4(a)	0.806 (g)	**1**
4(b)	**Any TWO from:** • heat (1) • stir / shake the container (1) • grind crystals / make crystals smaller (1)	**2**
4(c)	wash out container with water **AND** transfer washings to volumetric flask	**1**
4(d)	pipette is more accurate than measuring cylinder	**1**
4(e)(i)	colourless to (pale) pink	**1**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>4(e)(ii)</td><td>
<table>
<tr><td>titration number</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>final burette reading / cm^3</td><td>26.3</td><td>29.3</td><td>47.1</td></tr>
<tr><td>initial burette reading / cm^3</td><td>0.0</td><td>3.6</td><td>21.6</td></tr>
<tr><td>volume / cm^3</td><td>26.3</td><td>25.7</td><td>25.5</td></tr>
<tr><td>best titration results (✓)</td><td></td><td>✓</td><td>✓</td></tr>
</table>
(3)
average volume = 25.6 (cm^3) (1)</td><td>4</td></tr>
<tr><td>4(f)</td><td>first two titrations are not close enough / not concordant/not within 0.2 cm^3 of each other / too far apart</td><td>1</td></tr>
<tr><td>4(g)</td><td>0.000256 (mol) or 2.56×10^{-4}
ALLOW use of wrong mean titre</td><td>1</td></tr>
<tr><td>4(h)</td><td>0.00064 (mol) or 6.4×10^{-4}
ALLOW answer to **(g)** × 5 / 2</td><td>1</td></tr>
<tr><td>4(i)</td><td>0.0064 (mol) or 6.4×10^{-3}
ALLOW answer to **(e)** × 10</td><td>1</td></tr>
<tr><td>4(j)</td><td>126
ALLOW answer to **(a)** and / or **(i)** i.e. **(a)** / **(i)**</td><td>1</td></tr>
<tr><td>4(k)</td><td>**M1** 126 – 90 = 36 (1)
M2 36 ÷ 18 = 2 (1)
ALLOW use of answer to **(j)** to the nearest whole number</td><td>2</td></tr>
</table>

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Question	Answer	Marks
5	**M1** magnesium: bubbles / effervescence / fizzing / hydrogen evolved / solid dissolves with hydrochloric acid / solid disappears with hydrochloric acid (1) **M2** acidified barium nitrate: white precipitate with sodium sulfate (1) **M3** ethanol: acidified potassium manganate(VII) + heat (1) **M4** turns colourless(1)	**4**

Question	Answer	Marks
6(a)(i)	(**L**) does not contain ions of a transition metal / (**L**) does not contain ions of a transition element / (**L**) does not contain a compound of a transition metal / (**L**) does not contain a compound of a transition element	**1**
6(a)(ii)	limewater (1) milky / white precipitate (1)	**2**
6(a)(iii)	carbonate / CO_3^{2-}	**1**
6(b)	(i) Ca^{2+} or Al^{3+} or Zn^{2+} (ii) Ca^{2+}	**1**
6(c)	**M1** NaOH(aq) / aqueous sodium hydroxide (1) **M2** Aluminium foil / Devarda's alloy (1) **M3** Warm / heat / boil (1) **M4** Ammonia / NH_3 / **gas** turns litmus blue (1)	**4**

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Question	Answer	Marks
7(a)	to make sure all the oxygen in the air reacts	**1**
7(b)	so that all volumes were measured at the same temperatures / volume is temperature dependent / gases expand at high(er) temperatures **OR** reverse argument	**1**
7(c)(i)	**M1** all points correctly plotted (1) **M2** straight line of best fit drawn (1) **M3** line extended to edge of grid at upper end (1)	**3**
7(c)(ii)	point at 60,52 circled	**1**
7(c)(iii)	gas was not cooled / gas was not passed over copper for long enough / not all the oxygen reacted	**1**
7(d)(i)	79 (cm^3)	**1**
7(d)(ii)	100 – 79 (= 21%) **ALLOW** 100 – answer to **(d)(i)** (mark is for working not for answer)	**1**

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