Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CHEMISTRY **0620/43**

Paper 4 Extended Theory **October/November 2018**

MARK SCHEME

Maximum Mark: 80

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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This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **11** printed pages.

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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)	oxygen	**1**
1(b)	hematite	**1**
1(c)	sulfur dioxide	**1**
1(d)	ammonia	**1**
1(e)	carbon monoxide	**1**
1(f)	sodium chloride	**1**
1(g)	carbon dioxide	**1**
1(h)	oxygen	**1**

Question	Answer	Marks
2(a)(i)	**M1** breakdown of an ionic **compound** when molten or in aqueous solution **M2** (using) electricity / electric current	**2**
2(a)(ii)	**M1** electron(s) **M2** ion(s)	**2**
2(b)(i)	**M1** inert / unreactive **M2** conducts **electricity**	**2**

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Question	Answer	Marks
2(b)(ii)		**6**

observation at anode(+)	name of product at anode(+)	observation at cathode(–)	name of product at cathode(–)
M1 green / yellow bubbles	**M2** chlorine		**M3** hydrogen
	M4 oxygen	**M5** pink / brown solid	**M6** copper

Question	Answer	Marks
3(a)	[(64 · 2) + 56 + 119 + (32 · 4) =] **431**	**1**
3(b)	[(119 / 151) · 100 =] **78.8 (%)**	**1**
3(c)	SnO_2 because the percentage of tin is **larger** in SnO_2 **or** answer to **(b)** > 27.6 %	**1**
3(d)	$SnO_2 + 2C \rightarrow Sn + 2CO$ **M1 all** formulae correct **M2** equation fully correct	**2**
3(e)	**M1** (→) $Fe^{2+} + Sn$ **OR** $2Fe + 3Sn^{2+} \rightarrow 2Fe^{3+} + 3Sn$ **M2** (→) $Sn^{2+} + Cu$ **OR** $Sn + 2Cu^{2+} \rightarrow Sn^{4+} + 2Cu$	**2**
3(f)(i)	**M1** glowing splint **M2** relights / rekindles	**2**

Question	Answer	Marks
3(f)(ii)	**M1** nitrogen dioxide / nitrogen(IV) oxide **M2** brown (gas)	**2**
3(f)(iii)	$2Cu(NO_3)_2 \rightarrow 2CuO + 4NO_2 + O_2$	**1**
3(g)(i)	zinc acts as a barrier which prevents contact between iron and water and air / oxygen	**1**
3(g)(ii)	**SUMMARY** **M1** comparison of reactivity **M2** zinc loses **electrons** **M3** where **electrons** move to **OR** iron does not lose electrons **M1** zinc is **more** reactive than iron / steel **ORA** **M2** zinc loses electrons / zinc is oxidised **M3** electrons are transferred to iron / iron is not oxidised / iron does not lose electrons	**3**

Question	Answer	Marks
4(a)	**M1** (Mol KOH =) 0.00125 / 1.25 · 10^{-3} **M2** (Mol H_2SO_4 =) 0.000625 / 6.25 · 10^{-4} **M3** (Conc H_2SO_4 =) 0.03125 / 3.125 · 10^{-2} (mol / dm^3)	**3**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>4(b)</td><td>SUMMARY
<table>
<tr><td>M1</td><td>repeat</td></tr>
<tr><td>M2</td><td>heat (liquid or solution should be implied)</td></tr>
<tr><td>M3</td><td>when to stop heating</td></tr>
<tr><td>M4</td><td>what to do after heating</td></tr>
<tr><td>M5</td><td>method of drying crystals (crystals or solid should be implied)</td></tr>
</table>
M1 repeat without indicator using same volumes

M2 evaporate / heat / warm / boil / leave in sun

M3 until most of the water is gone / some water left / saturation(point) / crystallisation point / evaporate some of the water

M4 leave / (allow to) cool / allow to crystallise

M5 details of drying</td><td>5</td></tr>
<tr><td>4(c)(i)</td><td>M1 bubbles / effervescence / fizzing

M2 solid or magnesium dissolves / solid or magnesium disappears</td><td>2</td></tr>
<tr><td>4(c)(ii)</td><td>lilac flame</td><td>1</td></tr>
<tr><td>4(c)(iii)</td><td>white precipitate</td><td>1</td></tr>
<tr><td>4(d)(i)</td><td>$Mg(OH)_2 + H_2SO_4 \rightarrow MgSO_4 + 2H_2O$

M1 formula of both $Mg(OH)_2$ and $MgSO_4$

M2 equation fully correct</td><td>2</td></tr>
</table>

Question	Answer	Marks
4(d)(ii)	$Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$ **M1** formula of $ZnSO_4$ **M2** equation fully correct	**2**
4(d)(iii)	$Na_2CO_3 + H_2SO_4 \rightarrow Na_2SO_4 + CO_2 + H_2O$ **M1** formulae of **both** Na_2CO_3 and Na_2SO_4 **M2** equation fully correct	**2**

Question	Answer	Marks
5(a)	**M1** volume of gas **M2** time	**2**
5(b)	**M1** rate decreases / reaction gets slow**er** **M2** concentration of acid decreases **M3** fewer collisions per unit time	**3**

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Question	Answer	Marks
5(c)	**M1** particles have **more** kinetic energy **M2** particles move fast**er** **M3 more** collisions **per unit time** **M4 more** of the particles have energy greater than or equal to activation energy / **more** of the collisions have energy greater than or equal to activation energy **OR** **more** of the particles have sufficient energy to react / **more** of the collisions have sufficient energy to react **OR** A great**er** percentage or great**er** proportion or great**er** fraction of collisions are successful	**4**
5(d)	**ANY TWO FROM:** increase concentration of hydrochloric acid decrease particle size of calcium carbonate / increase surface area of calcium carbonate (add)catalyst	**2**

Question	Answer	Marks
6(a)(i)	**SUMMARY** **M1 and M4** – reactants **M2 and M5** – conditions **M3 and M6** – equation **FERMENTATION:** **M1** glucose / sucrose / starch / other named carbohydrate can score in equation as correct formula **M2** Zymase / Yeast / 37°C **M3** $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$ **HYDRATION:** **M4** Ethene and steam or water can score in equation as correct formulae **M5** H_3PO_4 (catalyst) / 300°C / 60 atm **M6** $C_2H_4 + H_2O \rightarrow C_2H_5OH$	**6**
6(a)(ii)	**ANY TWO FROM:-** carbohydrates are renewable fossil fuels are non-renewable low**er** temperature means fossil fuels conserved **ORA** low**er** temperature means low**er** energy costs **ORA** hydration reaches an equilibrium meaning low**er** yield **ORA**	**2**
6(a)(iii)	**M1** solvent **M2** fuel	**2**
6(b)(i)	**E**	**1**

Question	Answer	Marks
6(b)(ii)	**D**	**1**
6(b)(iii)	**B**	**1**
6(b)(iv)	**C**	**1**
6(b)(v)	**A**	**1**

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