Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CHEMISTRY **0620/31**

Paper 3 Theory (Core) **October/November 2019**

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.

Cambridge International is publishing the mark schemes for the October/November 2019 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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Question	Answer	Marks
1(a)(i)	(anhydrous) cobalt chloride	**1**
1(a)(ii)	graphite	**1**
1(a)(iii)	calcium oxide	**1**
1(a)(iv)	aluminium	**1**
1(a)(v)	ceramic	**1**
1(b)(i)	A: melting (1) B: condensing / condensation (1)	**2**
1(b)(ii)	***solid:*** particles arranged regularly / particles ordered (1) particles touching / particles close together (1) ***liquid:*** particles arranged irregularly / particles randomly arranged (1) particles close together / particles touching (1)	**4**

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Question	Answer	Marks
2(a)	6.0 / 6 (%)	**1**
2(b)(i)	2 (O_2) (1) 2 (H_2O) (1)	**2**
2(b)(ii)	propane	**1**
2(b)(iii)	3 correct (2) 1 or 2 correct (1) fuel oil → fuel for ships bitumen → making roads naphtha → making chemicals	**2**
2(c)(i)	two (hydrogen) atoms with pair of electrons between and no other electrons	**1**
2(c)(ii)	fuel	**1**
2(d)(i)	circle around the COOH group only	**1**
2(d)(ii)	5	**1**
2(e)	glucose / sugar (1) yeast (1) **AND** 1 mark each for any two of: oxygen absent / anaerobic room temperature / stated temperature between 5 °C and 40 °C (inclusive) pH near neutral presence of water / aqueous solution purify by distillation	**4**

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Question	Answer	Marks
3(a)	measuring volume of carbon dioxide (1) use of gas measuring apparatus e.g. syringe / inverted measuring cylinder full of water (1) (measure gas volume) at time intervals (1)	3
3(b)	31.25 (g)	1
3(c)	decreases (rate) / slower (rate) (1) increases (rate) faster (rate) (1)	2
3(d)	(thermal) decomposition of carbonates (1) respiration (1)	2

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Question	Answer	Marks
4(a)(i)	protons: 11 (1) electrons: 11 (1) neutrons: 12 (1)	**3**
4(a)(ii)	treating cancer / thyroid function / tracer for diagnosis	**1**
4(b)(i)	electron in outer shell (1) electrons in first shell **AND** eight electrons in the second shell (1)	**2**
4(b)(ii)	electron	**1**
4(c)(i)	sodium hydroxide (1) hydrogen (1)	**2**
4(c)(ii)	heat given out / heat evolved	**1**
4(c)(iii)	basic (no mark alone) **AND** sodium is a metal (1)	**1**
4(d)	manganese < uranium < lanthanum < calcium (2) if 2 marks not scored allow 1 mark for 1 consecutive pair reversed	**2**

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Question	Answer	Marks
5(a)(i)	density of chlorine: any value between 1 g / cm^3 and 3 g / cm^3 inclusive (1) boiling point of iodine: any value between 115 °C and 320 °C inclusive (1)	**2**
5(a)(ii)	increases (down the group)	**1**
5(a)(iii)	liquid (1) 50 °C is between the melting point and boiling point / 50 °C is higher than the melting point but lower than the boiling point (1)	**2**
5(b)	potassium iodide (1) potassium bromide (1)	**2**
5(c)(i)	fluorine more reactive than chlorine ORA	**1**
5(c)(ii)	2 (NH_3) (1) 3 (F_2) (1)	**2**
5(c)(iii)	217 (2) if 2 marks not scored 1 mark for F = 2 · 19 **OR** 38 (1)	**2**
5(c)(iv)	removal of oxygen / addition of hydrogen / gain of electrons / decrease in oxidation number	**1**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>6(a)(i)</td><td>neutralisation</td><td>1</td></tr>
<tr><td>6(a)(ii)</td><td>1 mark each for any three of:
evaporation / molecules escape from surface of the liquids
diffusion
molecules in (constant) movement / molecules collide
(movement of) molecules is random / in every direction
molecules spread out / molecules mix
(molecules spread) from higher concentration to lower concentration
molecules react (when they collide)</td><td>3</td></tr>
<tr><td>6(b)</td><td>nitrogen (1)

phosphorus (1)

potassium (1)</td><td>3</td></tr>
<tr><td>6(c)</td><td>1 mark each for any three of:
<table><tr><td>white precipitate (1)</td><td>(precipitate) does not dissolve / (precipitate) insoluble / white precipitate remains (1)</td></tr><tr><td>white precipitate (1)</td><td>(precipitate) dissolves / (precipitate) soluble (in excess) / colourless solution (1)</td></tr></table></td><td>3</td></tr>
</table>

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Question	Answer	Marks
7(a)(i)	graphite (1) conducts electricity / inert (1)	**2**
7(a)(ii)	positive electrode: chlorine (1) negative electrode: magnesium (1)	**2**
7(b)	(C), A, F, D, B, E (2) if 2 marks not scored 1 mark for 1 consecutive pair reversed	**2**
7(c)	1 mark each for any two of: high density ORA for Mg forms coloured compounds ORA for Mg forms ions with different charges / has variable oxidation number ORA for Mg forms complex ions ORA for Mg copper is catalyst ORA for Mg reference to difference in chemical properties e.g. magnesium reacts with dilute acid / copper does not react with dilute acid	**2**
7(d)(i)	R	**1**
7(d)(ii)	T	**1**
7(d)(iii)	R	**1**

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