Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CHEMISTRY **0620/33**

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.

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

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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)	carbon monoxide	**1**
1(a)(ii)	propene	**1**
1(a)(iii)	carbon dioxide	**1**
1(a)(iv)	chlorine	**1**
1(a)(v)	sulfur dioxide	**1**
1(b)(i)	goes from solid to gas (1) directly / without liquid (being formed) (1)	**2**
1(b)(ii)	***solid:*** particles (only) vibrating (1) particles close together / particles touching (1) ***gas:*** particles moving rapidly / particles moving randomly (1) particles far apart (1)	**4**

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Question	Answer	Marks
2(a)(i)	1.5 (%)	**1**
2(a)(ii)	1 pair of electrons between each O and H (1) 4 non-bonding electrons on oxygen and none on the hydrogens (1)	**2**
2(a)(iii)	anhydrous copper(II) sulfate turns blue (2) IF: 2 marks not scored 1 mark for anhydrous copper sulfate **or** copper sulfate turns blue **OR** anhydrous cobalt(II) chloride turns pink / red (2) IF: 2 marks not scored 1 mark for anhydrous cobalt chloride **or** cobalt chloride turns pink	**2**
2(b)(i)	2 (CH_4) (1) 4 (H_2) (1)	**2**
2(b)(ii)	butane	**1**
2(c)(i)	3 correct (2) 1 or 2 correct (1) gasoline → fuel for cars lubricating fraction → making polishes bitumen → making roads	**2**
2(c)(ii)	(property on which fractional distillation) depends is the boiling point (1) **AND** 1 mark each for any two of: • idea of (fractional distillation) column • petroleum heated / petroleum vaporised • petroleum vapour enters at bottom of fractionating column • temperatures high at bottom of column and low at the top • different fractions / compounds move different distances • vapour turns to liquid in condenser / vapour turns to liquid when it reaches a certain height	**3**
2(d)(i)	circle round the COOH group	**1**

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Question	Answer	Marks
2(d)(ii)	5	**1**

Question	Answer	Marks
3(a)	179.3 (g)	**1**
3(b)	A (1) the gradient / slope is the steep(est) (1)	**2**
3(c)	360 (cm^3)	**1**
3(d)	decreases rate / reaction slower (1) increases rate / reaction faster (1)	**2**

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Question	Answer	Marks
4(a)	protons: 16 (1) electrons: 16 (1) neutrons: 17 (1)	**3**
4(b)	6 electrons in outer shell (1) 2, 8 electrons in inner shells (1)	**2**
4(c)	gold < copper < tin < sodium (2) if 2 marks not scored: 1 mark for 1 consecutive pair reversed	**2**
4(d)	underground / named geographical source, e.g. Poland / Louisiana / Sicily	**1**
4(e)(i)	food preservative / manufacture of wood pulp	**1**
4(e)(ii)	magnesium sulfate (1) hydrogen (1)	**2**

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Question	Answer	Marks
5(a)(i)	melting point of lithium: values between 110 ºC and 210 ºC (inclusive) (1) atomic radius of potassium: values between 190 pm and 240 pm (inclusive) (1)	**2**
5(a)(ii)	decreases (down the group)	**1**
5(a)(iii)	there is no trend in thermal conductivity (of the other elements down the group)	**1**
5(a)(iv)	liquid (1) 45 ºC is between the melting points and boiling point / 45 ºC is above the melting point and below the boiling point (1)	**2**
5(b)(i)	4 (Li) (1) 2 (Li_2O) (1)	**2**
5(b)(ii)	basic (oxide) **AND** Li is a metal	**1**
5(b)(iii)	electron	**1**
5(b)(iv)	36 if 2 marks not scored: 1 mark for C = 2 × 12 **OR** 24	**2**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>6(a)</td><td>sodium carbonate + calcium hydroxide → sodium hydroxide + calcium carbonate
if 2 marks not scored 1 mark for a correct name of one of the carbonates or calcium hydroxide</td><td>2</td></tr>
<tr><td>6(b)</td><td>1 mark each for any three of:

<table><tr><th>aqueous ions tested</th><th>small volume of aqueous sodium hydroxide</th><th>aqueous sodium hydroxide in excess</th></tr><tr><td>chromium(III), Cr^{3+}</td><td>green ppt (1)</td><td>(ppt) soluble / (ppt) dissolves (1)</td></tr><tr><td>iron(II), Fe^{2+}</td><td>green ppt (1)</td><td>(ppt) insoluble (1)</td></tr></table></td><td>3</td></tr>
<tr><td>6(c)</td><td>1 mark each for any three of:
• evaporation / molecules escape from aqueous ammonia
• 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
• (ammonia) molecules react with litmus</td><td>3</td></tr>
<tr><td>6(d)(i)</td><td>speeds up rate of reaction / makes reaction faster</td><td>1</td></tr>
<tr><td>6(d)(ii)</td><td>any suitable source, e.g. from car engines / lightning / high temperature furnaces</td><td>1</td></tr>
<tr><td>6(d)(iii)</td><td>irritates eyes / nose / mouth / skin / airways / lungs</td><td>1</td></tr>
</table>

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Question	Answer	Marks
6(e)	2nd box down ticked (potassium phosphate)	**1**
6(f)	endothermic	**1**

Question	Answer	Marks
7(a)	positive electrode: oxygen / O_2 (1) negative electrode: aluminium / A*l* (1)	**2**
7(b)	strong (1) density (1) corrosion (1)	**3**
7(c)	(D), F, A, C, E, B (2) if 2 marks not scored: 1 mark for 1 consecutive pair of letters reversed	**2**

Question	Answer	Marks
8(a)(i)	U	**1**
8(a)(ii)	T	**1**
8(a)(iii)	T	**1**
8(b)(i)	loss of oxygen / decrease in oxidation number / gain of electrons / addition of hydrogen	**1**
8(b)(ii)	oxidation	**1**

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