Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CHEMISTRY **0620/31**

Paper 3 Theory (Core) **May/June 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 May/June 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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)	B / diamond (1) D / nitrogen / N_2 (1)	**2**
1(a)(ii)	D / nitrogen / N_2	**1**
1(a)(iii)	C / lithium chloride / LiCl	**1**
1(a)(iv)	C / lithium chloride / LiCl	**1**
1(a)(v)	B / diamond	**1**
1(a)(vi)	E / copper / Cu	**1**
1(b)	substance in which all the atoms have the same proton number / substance containing (only) one type of atom	**1**

Question	Answer	Marks
2(a)	hematite	**1**
2(b)	2 (C) (1) O_2 (1)	**2**
2(c)	carbon gains oxygen (from Fe_2O_3) / oxygen (from Fe_2O_3) combines with carbon	**1**
2(d)(i)	thermal decomposition	**1**
2(d)(ii)	basic oxide (1) calcium is a metal (oxide) (1)	**2**

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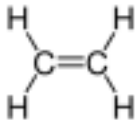
Question	Answer	Marks
2(e)	any **three** from: • conduct electricity • conduct heat • malleable • ductile • shiny / lustrous	**3**
2(f)	$Fe_2C_9O_9$	**1**

Question	Answer	Marks
3(a)(i)	5.0%	**1**
3(a)(ii)	oxygen	**1**
3(a)(iii)	any **two** from: • more hydrogen in Universe (or reverse argument) • more helium in Universe (or reverse argument) • more oxygen on Earth (or reverse argument) • more magnesium on Earth (or reverse argument) • more iron on Earth (or reverse argument) • more silicon on Earth (or reverse argument) • more sulfur on Earth (or reverse argument)	**2**
3(b)	2 electrons in inner shell **AND** 6 electrons in outer shell **AND** no additional shells of electrons	**1**
3(c)(i)	has complete **outer** (electron) shell / has full **outer** (electron) shell / **outer** shell cannot gain or lose electron(s)	**1**
3(c)(ii)	lamps / inert atmosphere (in metal extraction)	**1**

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Question	Answer	Marks
4(a)	*solid:* particles touching / particles close together (1) particles (only) vibrating / not moving from place to place (1) *gas:* particles far apart (1) particles moving fast / particles moving randomly / particles moving in any direction (1)	**4**
4(b)	increasing the pressure decreases the volume / decreasing the pressure increases the volume / the higher the volume, the lower the pressure	**1**
4(c)(i)	bromine (1) potassium iodide (1)	**2**
4(c)(ii)	chlorine more reactive than iodine / iodine less reactive than chlorine	**1**
4(d)(i)	2 ($Na_2S_2O_3$) (1) 2 (NaI) (1)	**2**
4(d)(ii)	the energy of the reactants is more than the energy of the products / the energy of the products is less than the energy of the reactants / the reactants lose energy when they form products	**1**
4(e)	add (acidified aqueous) silver nitrate (1) yellow precipitate (1)	**2**
4(f)	iodine / I_2	**1**

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Question	Answer	Marks
5(a)(i)	methane	**1**
5(a)(ii)		**1**
5(a)(iii)	with methane (aqueous) bromine remains orange (1) with ethene (aqueous) bromine decolourised (1)	**2**
5(b)(i)	polymerisation / addition	**1**
5(b)(ii)	monomers	**1**
5(b)(iii)	cannot be decomposed by organisms / cannot be broken down by bacteria / cannot be broken down by fungi	**1**
5(b)(iv)	gets stuck in gullets of birds / gets stuck in gullets of animals / blocks drains	**1**
5(c)	steam (1) high temperature (1) catalyst (1)	**3**

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Question	Answer	Marks
6(a)	any **three** from: • **heat** copper oxide with sulfuric acid • filter off (excess) copper oxide • heat **filtrate** to point of crystallisation / heat (copper sulfate) **solution** to point of crystallisation • dry between filter papers / dry in drying oven	**3**
6(b)(i)	reversible reaction	**1**
6(b)(ii)	heat / warm	**1**
6(c)	160 (2 marks) if 2 marks not scored 1 mark for S = (1 × 32) = 32 **OR** O (= 4 × 16) = 64	**2**
6(d)	electrons in S = 16 (1) electrons in Cu^{2+} = 27 (1) neutrons in S = 18 **AND** neutrons in Cu^{2+} = 34 (1) protons in S = 16 (1)	**4**
6(e)(i)	**mixture** of metal and other elements	**1**
6(e)(ii)	(alloy) more resistant to wear / stronger / harder / more resistant to corrosion **ORA** for copper	**1**

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Question	Answer	Marks
7(a)	calcium chloride	1
7(b)(i)	gas released / gas escapes / gas lost	1
7(b)(ii)	0.7 (g)	1
7(b)(iii)	line steeper than original and starting from 0 and 200.0 g (1) line ends up at same final mass AND levels off at or before 104 s (1)	2
7(b)(iv)	0.22 (g)	1
7(b)(v)	large pieces → 0.005 small pieces → 0.030 powder → 0.100	1

Question	Answer	Marks
8(a)(i)	burning fossil fuels / volcanoes / heating (sulfide) ores	1
8(a)(ii)	substance which speeds up a reaction / substance which increases the rate of reaction	1
8(a)(iii)	pH4	1
8(a)(iv)	erodes buildings (made of carbonate rocks) / wears away buildings (made of carbonate rocks) / reacts with mortar / corrodes iron work / corrodes metal	1
8(b)	liquid (1) –20 °C is between the melting and boiling point / –20 °C is above melting point but lower than boiling point (1)	2

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Question	Answer	Marks
8(c)	ammonium sulfate	**1**
8(d)	tungsten < nickel < iron < magnesium (2) if 2 marks not scored 1 mark for one consecutive pair reversed	**2**

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