

Cambridge International Examinations Cambridge International General Certificate of Secondary Education

## CHEMISTRY

0620/43 October/November 2016

Paper 4 Extended Theory 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 will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2016 series for most Cambridge IGCSE<sup>®</sup>, Cambridge International A and AS Level components and some Cambridge O Level components.

® IGCSE is the registered trademark of Cambridge International Examinations.

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 8 printed pages.

**CAMBRIDGE** International Examinations

Page 2	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0620	43

Question			An	swer	Marks
1(a)	proton	+1	1	7	2
	neutron	0	1		
	electron	–1	<sup>1</sup> / <sub>1840</sub>		
1(b)(i)	(same) number of pr (different) neutron (r			six electrons	2
1(b)(ii)	same <u>number</u> of ele	ctrons/electron	configuration		1
1(c)	diamond and graphi	te			1
1(d)	two double bonds wi both oxygen atoms v			atoms	1

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0620	43

Question	Answer	Marks
2(a)	2,2/2.2	1
2(b)	BeO	1
2(c)(i)	positive ions/cations labelled or named in text electrons labelled or named in text attraction between positive ions and negative electrons	1 1 1
2(c)(ii)	(conduction due to) moving electrons/mobile electrons	1
2(d)(i)	Be <sup>2+</sup>	1
2(d)(ii)	$\begin{array}{rcl} Be(OH)_2 \ + \ 2HCl \ \rightarrow \ BeCl_2 \ + \ 2H_2O \\ \\ \text{formula of } BeCl_2 \\ \text{all formulae correct and balancing correct} \end{array}$	2
2(d)(iii)	$\begin{array}{l} 2NaOH \ + \ Be(OH)_2 \ \rightarrow \ Na_2BeO_2 \ + \ 2H_2O \\ \\ formula \ of \ Na_2BeO_2 \\ all \ formulae \ correct \ and \ balancing \ correct \end{array}$	2

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0620	43

Question	Answer	Marks
3(a)	331	1
3(b)(i)	$ \begin{array}{l} \textbf{M1} \mbox{ mol} = 6.62/331 \textbf{OR} \ 0.02 \\ \textbf{M2} \ 0.02 \times 223 = 4.46 \ (g) \end{array} $	1
3(b)(ii)	<b>M1</b> mol $O_2 = 0.02 \div 2$ <b>OR</b> 0.01 <b>M2</b> vol = 0.01 × 24 = 0.24 (dm <sup>3</sup> )	1
3(c)	<i>test:</i> glowing splint <i>result:</i> relights/rekindles	1
3(d)(i)	more than enough to react (with all the acid) OR some lead oxide remains after the reaction OR (nitric) acid is limiting	1
3(d)(ii)	solid stops dissolving	1
3(d)(iii)	$\begin{array}{rcl} PbO & + & 2HNO_3 \ \rightarrow & Pb(NO_3)_2 \ + & H_2O \\ \textbf{OR} \\ PbO & + & 2H^+ \ \rightarrow \ Pb^{2^+} \ + \ H_2O \end{array}$	1

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0620	43

Question	Answer	Marks
4(a)	<i>silicon(IV) oxide</i> : covalent <i>sodium chloride</i> : ionic/electrovalent	1
4(b)	giant molecular/macromolecular/giant covalent/giant atomic	1
4(c)(i)	M1 (covalent) bonds are strong M2 a lot of heat or energy is needed to break/weaken/overcome bonds OR there are no <u>weak bonds</u> OR there are <u>no intermolecular forces</u> OR covalent bonds are the <u>only bonds</u> OR strong bonds are the <u>only bonds</u>	2
4(c)(ii)	(it has) no moving ions/no moving electrons/all electrons are used in bonding/no moving charged particles	1
4(d)	(sodium chloride contains) ions/is ionic in the solid ions are not moving/they are in fixed positions ions can move when molten	1 1 1
4(e)(i)	product at the positive electrode: chlorine product at the negative electrode: hydrogen	1
4(e)(ii)	$\begin{array}{rcl} 2H^{*} &+& 2e(\bar{}) \rightarrow H_{2} \\ \mathbf{OR} \\ 2H_{3}O^{*} &+& 2e(\bar{}) \rightarrow H_{2} &+& 2H_{2}O \end{array}$	1
4(f)	oxygen	1
4(g)(i)	sodium	1
4(g)(ii)	$Na^+ + e() \rightarrow Na$	1

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0620	43

Question	Answer	Marks
4(g)(iii)	<i>test:</i> (damp blue) litmus <i>result:</i> bleached/removes colour/(turns) white	1 1

Question	Answer	Marks
5(a)(i)	burned/heated in air	1
5(a)(ii)	$S + O_2 \rightarrow SO_2$	1
5(b)(i)	equilibrium/reversible	1
5(b)(ii)	vanadium(V) oxide / vanadium pentoxide	1
5(b)(iii)	increase rate (of reaction)/allow lower temperature to be used/allow lower pressure to be used	1
5(b)(iv)	less $SO_3$ forward reaction is exothermic/it is exothermic/reverse reaction is endothermic	1
5(b)(v)	rate too low/reaction too slow/slower	1
5(b)(vi)	more $SO_3$ fewer moles or molecules (of gas) on right-hand side/more moles or molecules(of gas) on left-hand side	1
5(c)(i)	concentrated sulfuric acid/concentrated H <sub>2</sub> SO <sub>4</sub>	1
5(c)(ii)	$SO_3 + H_2SO_4 \rightarrow H_2S_2O_7$	1

Page 7	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0620	43

Question	Answer	Marks
5(d)(i)	water	1
5(d)(ii)	$H_2S_2O_7 + H_2O \rightarrow 2H_2SO_4$	1
5(e)	detergents/car batteries/dyes/paints/synthetic resins/printing inks/metal extraction/cleaning metals/	1
5(f)(i)	exists completely as ions (in solution)/completely dissociates (in solution)/completely ionises (in solution)	1
5(f)(ii)	Universal Indicator/pH paper/pH indicator/pH meter Universal Indicator or pH paper or pH indicator turns red/pH 0–1	1
5(f)(iii)	$Na_2CO_3 + 2C_6H_5SO_3H \rightarrow 2C_6H_5SO_3Na + CO_2 + H_2O$ formula of $C_6H_5SO_3Na$	2
	all formulae correct and balancing correct	

Question	Answer	Marks
6(a)(i)	<ul> <li>condensation:</li> <li>M1 (two) molecules/monomers joining</li> <li>M2 with the removal of a (small) molecule</li> <li><i>polymerisation:</i></li> <li>M3 (to form) a large molecule/a long chain</li> </ul>	3
6(a)(ii)	addition	1
6(b)(i)	circled amide link	1
6(b)(ii)	all missing atoms and bonds shown on the diacid all missing atoms and bonds shown on the diamine	1

Page 8	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0620	43

Question	Answer	Marks
6(b)(iii)	nylon/Kevlar/Nomex	1
6(c)(i)	amino acids	1
6(c)(ii)	hydrolysis chromatography (spray with) locating agent/UV determine <i>R</i> <sub>f</sub> values/compare with standards	1 1 1 1