



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CHEMISTRY

0620/43

Paper 4 Extended Theory

October/November 2016

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[®], 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.

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

Question	Answer	Marks									
1(a)	<table border="1"> <tr> <td>proton</td><td>+1</td><td>1</td></tr> <tr> <td>neutron</td><td>0</td><td>1</td></tr> <tr> <td>electron</td><td>−1</td><td>$\frac{1}{1840}$</td></tr> </table>	proton	+1	1	neutron	0	1	electron	−1	$\frac{1}{1840}$	2
proton	+1	1									
neutron	0	1									
electron	−1	$\frac{1}{1840}$									
1(b)(i)	(same) number of protons and electrons / 6 protons and six electrons (different) neutron (number) / 6, 7 and 8 neutrons	2 1									
1(b)(ii)	same <u>number</u> of electrons / electron configuration	1									
1(c)	diamond <i>and</i> graphite	1									
1(d)	two double bonds with no extra electrons on the carbon atoms both oxygen atoms with four non-bonding electrons	1 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)	<u>positive ions / cations</u> labelled or named in text <u>electrons</u> labelled or named in text <u>attraction</u> between positive ions and negative electrons	1 1 1
2(c)(ii)	(conduction due to) moving electrons / mobile electrons	1
2(d)(i)	Be ²⁺	1
2(d)(ii)	$\text{Be(OH)}_2 + 2\text{HCl} \rightarrow \text{BeCl}_2 + 2\text{H}_2\text{O}$ formula of BeCl ₂ all formulae correct and balancing correct	2
2(d)(iii)	$2\text{NaOH} + \text{Be(OH)}_2 \rightarrow \text{Na}_2\text{BeO}_2 + 2\text{H}_2\text{O}$ formula of Na ₂ BeO ₂ all formulae correct and balancing correct	2

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

Question	Answer	Marks
3(a)	331	1
3(b)(i)	M1 mol = $6.62 / 331$ OR 0.02 M2 $0.02 \times 223 = 4.46$ (g)	1 1
3(b)(ii)	M1 mol O ₂ = $0.02 \div 2$ OR 0.01 M2 vol = $0.01 \times 24 = 0.24$ (dm ³)	1 1
3(c)	<i>test:</i> glowing splint <i>result:</i> relights / rekindles	1 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)	$\text{PbO} + 2\text{HNO}_3 \rightarrow \text{Pb}(\text{NO}_3)_2 + \text{H}_2\text{O}$ OR $\text{PbO} + 2\text{H}^+ \rightarrow \text{Pb}^{2+} + \text{H}_2\text{O}$	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 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)	<i>product at the positive electrode</i> : chlorine <i>product at the negative electrode</i> : hydrogen	1 1
4(e)(ii)	$2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$ OR $2\text{H}_3\text{O}^+ + 2\text{e}^- \rightarrow \text{H}_2 + 2\text{H}_2\text{O}$	1
4(f)	oxygen	1
4(g)(i)	sodium	1
4(g)(ii)	$\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$	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 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 1
5(c)(i)	concentrated sulfuric acid / concentrated H_2SO_4	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)	$\text{H}_2\text{S}_2\text{O}_7 + \text{H}_2\text{O} \rightarrow 2\text{H}_2\text{SO}_4$	1
5(e)	detergents / car batteries / dyes / paints / synthetic resins / printing inks / metal extraction / cleaning metals /	1
5(f)(i)	exists <u>completely</u> as ions (in solution) / <u>completely</u> dissociates (in solution) / <u>completely</u> 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 1
5(f)(iii)	$\text{Na}_2\text{CO}_3 + 2\text{C}_6\text{H}_5\text{SO}_3\text{H} \rightarrow 2\text{C}_6\text{H}_5\text{SO}_3\text{Na} + \text{CO}_2 + \text{H}_2\text{O}$ formula of $\text{C}_6\text{H}_5\text{SO}_3\text{Na}$ all formulae correct and balancing correct	2

Question	Answer	Marks
6(a)(i)	<i>condensation:</i> M1 (two) molecules / monomers joining M2 with the removal of a (small) molecule <i>polymerisation:</i> M3 (to form) a large molecule / a long chain	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 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	1
	chromatography	1
	(spray with) locating agent / UV	1
	determine R_f values / compare with standards	1