

## **Cambridge International Examinations**

Cambridge International General Certificate of Secondary Education

CHEMISTRY 0620/42

Paper 4 Extended Theory

October/November 2016

MARK SCHEME
Maximum Mark: 80

## **Published**

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Page 2	Mark Scheme	Syllabus	Paper
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Question			Answe	er		Mark
1(a)	fixed volum	e <b>AND</b> take the shape of	the container			1
1(b)					_	6
	solid	touching	regular	vibrate		
	liquid					
	gas	not touching	random	random		
1(c)(i)	melting					1
1(c)(ii)	sublimation					1

Question	Answer	Mark
2(a)	(total) number of protons and neutrons in a nucleus (of an atom)	2
2(b)	Na 2:8:1 P <sup>3-</sup> 2:8:8	2
2(c)	radiotherapy OR treatment of cancer	1
2(d)	average mass of (naturally occurring) atom(s) (of an element) (compared to an atom of) <sup>12</sup> C	2

Page 3	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark
2(e)	chlorine must have more than one isotope the masses of these isotopes/(any given) mass numbers are averaged	2
2(f)	lattice of labelled $A\hat{l}^{3+}$ ions electrons seen on the diagram between the ions attraction between (positive) ions and (sea of/delocalised) electrons	3

Question	Answer	Mark
3(a)	nitrogen (78%) AND oxygen (21%) noble gases OR argon (1%)	2
3(b)	nitrogen <b>AND</b> oxygen (from the air) react (in the) high temperatures of a car engine NO <sub>x</sub> /oxides of nitrogen react with or dissolve in water (to form an acid)	3
3(c)	any 2 from: (named) ruminant animal/cattle/(anaerobic) digestion/flatulence (in animals) / animal waste/(animal) dung decomposing vegetation/animals/organisms/decaying (organic) matter/ (fractional distillation/cracking of) petroleum/crude oil/hydrocarbons/natural gas/coal/	2
3(d)	photosynthesis	1

Page 4	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark
4(a)	copper(II) carbonate fizzes/bubbles/effervescence dissolves/disappears  copper(II) oxide dissolves/disappears blue (solution formed)	2
4(b)(i)	Cu(NO <sub>3</sub> ) <sub>2</sub> <u>3</u> Cu <b>AND</b> <u>3</u> Cu(NO <sub>3</sub> ) <sub>2</sub>	2
4(b)(ii)	hydrogen (gas) is not produced (when copper reacts with nitric acid)	1

Question	Answer	Mark
5(a)	$20  \text{cm}^3$ M1 $M_r$ of MnO <sub>2</sub> : 87 M2 moles of MnO <sub>2</sub> used: $3.48/87 = 0.04$ M3 moles of HC $l$ needed: $0.04 \times 4 = 0.16$ M4 volume of HC $l$ needed: $(0.16/8.0) \times 1000$ AND $20  \text{cm}^3$	4
5(b)(i)	from colourless to yellow/orange/brown	2
5(b)(ii)	$Cl_2(g) + 2Br^-(aq) \rightarrow Br_2(aq) + 2Cl^-(aq)$ M1 (aq) as state symbols for the two products given M2 correct products M3 balancing	3

Page 5	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark
5(c)(i)	the (C=C) double bond	1
5(c)(ii)	addition OR bromination	1
5(d)(i)	substitution	1
5(d)(ii)	(compounds with the) same molecular formula different structural formulae or structures	2
5(d)(iii)	structure of 1–chloropropane structure of 2–chloropropane	2
5(e)(i)	I <sub>2</sub> O <sub>5</sub> M1 76.0/127 AND 24.0/16.0 M2 0.59 AND 1.5 OR 1 AND 2.5 M3 I <sub>2</sub> O <sub>5</sub>	3
5(e)(ii)	(turns) red/pink/orange/yellow iodine is a non-metal	2

Question	Answer	Mark
6(a)	bauxite/Alumina is dissolved in <u>molten</u> cryolite cryolite lowers the melting temperature molten aluminium forms anode reaction: $2O^{2-} \rightarrow O_2 + 4e^-$ cathode reaction: $Al^{3+} + 3e^- \rightarrow Al$	5

Page 6	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark
6(b)	carbon or graphite electrode reacts with oxygen/burns (in oxygen) / combusts	2
6(c)	use 1: manufacture of aircraft reason 1: low density use 2: food containers <b>OR</b> cooking foil reason 2: Al resistant to corrosion	4

Question	Answer	Mark
7(a)	large/big molecule made from (many) monomers (joined together)	2
7(b)(i)	hydrolysis	1
7(b)(ii)	acid (conditions)/enzyme	1
7(c)(i)	distance moved by substancedistance moved by solvent (front)	1
7(c)(ii)	circle around top spot	1
7(c)(iii)	mixture of amino acids is placed as a spot onto a (pencil) baseline placed into a (suitable) solvent/water a locating agent is added to the (finished) chromatogram (to reveal spots)	

Page 7	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark
7(d)	fully displayed amide link between any two 'blocks' dipeptide 1: amino acid <b>A</b> on left-hand side and amino acid <b>B</b> on right-hand side <b>AND</b> dipeptide 2: amino acid B on left-hand side and amino acid A on right-hand side correct terminal amine and carboxylic acid group on both correct dipeptides	3