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Cambridge International General Certificate of Secondary Education

CHEMISTRY

0620/33

Paper 3 Core Theory

October/November 2016

MARK SCHEME

Maximum Mark: 80

Published

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This document consists of 7 printed pages.

Page 2	Mark Scheme	Syllabus	Paper
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Question	Answer	Marks
1(a)(i)	O / oxygen	1
1(a)(ii)	Li / lithium	1
1(a)(iii)	Cr / chromium	1
1(a)(iv)	Br / bromine	1
1(a)(v)	Ar / argon	1
1(b)	titanium lowest density strong / resistant to corrosion	1 1 1

Question	Answer	Marks
2(a)(i)	phosphate / PO_4^{3-}	1
2(a)(ii)	sulfate	1
2(a)(iii)	0.5 (g)	1
2(b)	<i>test:</i> aluminium / magnesium / Devarda's alloy sodium hydroxide / strong alkali (and warm) <i>result:</i> gas given off turns (red) litmus blue	1 1 1
2(c)(i)	filtration / filter	1
2(c)(ii)	carbohydrate AND protein	1
2(c)(iii)	random / zigzag / go anywhere / irregular	1

Page 3	Mark Scheme	Syllabus	Paper
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Question	Answer	Marks
2(d)(i)	any 2 from: <ul style="list-style-type: none"> improve growth of plants increase protein (in plants) fertilisers add nitrogen / nitrates / phosphorous / phosphates / potassium to put back nitrogen / nitrates / phosphorous / phosphates / potassium <u>into the soil</u> 	2
2(d)(ii)	ammonia is produced / formed (ammonia) is a gas	1 1

Question	Answer	Marks
3(a)	<p><i>conditions required for ethanol manufacture by fermentation (max = [3])</i></p> <ul style="list-style-type: none"> uses yeast uses glucose / sugar(s) anaerobic / no oxygen present room temperature / quoted temperature between 10 (°C)–40 (°C) (inclusive) aqueous conditions / water needed pH 7 / near pH 7 / neutral <p><i>conditions required for ethanol manufacture by hydration of ethene (max = [3])</i></p> <ul style="list-style-type: none"> uses high temperature / heat uses a catalyst uses high pressure uses water / steam <p><i>equation (max = [2])</i></p> <ul style="list-style-type: none"> ethene + water / steam → ethanol glucose → ethanol + carbon dioxide 	5

Page 4	Mark Scheme	Syllabus	Paper
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Question	Answer	Marks
3(b)(i)	Liquid room temperature is between the melting point and boiling point (of methanol)/ room temperature is above the melting point but below the boiling point (of methanol)	1 1
3(b)(ii)	values between 125(°C)–145(°C) inclusive	1
3(b)(iii)	increases with (increasing) number of carbon atoms	1
3(c)(i)	structure of ethanol showing all of the atoms and all of the bonds OH instead of O–H and rest of structure correct = [1]	2
3(c)(ii)	any suitable use, e.g. fuel/sterilisation/antiseptic solvent/making a named chemical, e.g. ethanoic acid/	1

Question	Answer	Marks
4(a)	any 3 from: <ul style="list-style-type: none"> • diffusion • particles move / motion of particles • (movement is) random / in any direction / in all directions • particles spread out / particles mix • particles move from high to low concentration 	3
4(b)	<i>in pure water:</i> blue <i>in a strongly acidic solution:</i> yellow	1 1
4(c)(i)	A (volumetric) pipette B burette	1 1
4(c)(ii)	add (a few drops of) indicator to the flask slowly add acid (from the burette) into the alkali (until indicator) changes colour / until (alkali) neutralised / until neutral	1 1 1

Page 5	Mark Scheme	Syllabus	Paper
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Question	Answer	Marks
5(a)(i)	<u>endothermic</u> because heating is needed	1
5(a)(ii)	arrow(s) pointing in both directions / \rightleftharpoons	1
5(b)(i)	C in or just outside the tube at the top left L in or just outside the tube at the bottom right	1 1
5(b)(ii)	to produce a high temperature / for heat(ing)	1
5(c)	any 2 from: <ul style="list-style-type: none"> plants / crops do not grow well if the soil is too acidic increases the pH of the soil / makes the soil less acidic neutralises the acid 	2
5(d)(i)	<i>test:</i> (aqueous) barium chloride / (aqueous) barium nitrate <i>result:</i> white precipitate / white solid	1 1
5(d)(ii)	SiO ₂ / Si ₆ O ₁₂	1
5(e)(i)	pH 12	1
5(e)(ii)	H ₂ O	1
5(e)(iii)	any 3 from: <ul style="list-style-type: none"> (limewater absorbs) carbon dioxide (carbon dioxide) from the air carbon dioxide dissolves in limewater carbon dioxide (solution) is slightly acidic / carbon dioxide is an acidic oxide idea that carbon dioxide reacts with / neutralises calcium hydroxide / neutralises limewater / neutralises the solution pH (of limewater / solution) falls / pH goes down calcium carbonate is formed 	3

Page 6	Mark Scheme	Syllabus	Paper
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Question	Answer	Marks
6(a)(i)	(in order of their) atomic number / proton number	1
6(a)(ii)	less metallic across a period / metals on left of Periodic Table and non-metals on right of Periodic Table / electrical conductivity decreases / pattern in melting (or boiling) points (increases to a maximum then decreases)	1
6(a)(iii)	any 2 from: <ul style="list-style-type: none"> • density increases • melting / boiling point decreases • hardness decreases • reactivity increases 	2
6(b)(i)	<i>from:</i> colourless / (light) green <i>to:</i> brown	1 1
6(b)(ii)	iodine is more reactive than astatine ORA	1
6(c)(i)	H ₂ (on left) 2(HCl) (on right)	1 1
6(c)(ii)	one pair of bonding electrons between H and Cl 6 non-bonding electrons around Cl and none around H	1 1
6(c)(iii)	lithium chloride water	1 1

Page 7	Mark Scheme	Syllabus	Paper
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Question	Answer	Marks
7(a)	A condensation / condensing / condense B freezing / solidification	1 1
7(b)	<i>arrangement:</i> regular <i>motion:</i> (only) vibrating / not moving (from place to place)	1 1
7(c)	<u>acidic</u> because phosphorous is a non-metal / phosphorous is on the right-hand side of the Periodic Table	1
7(d)	any 2 from: <ul style="list-style-type: none"> • does not conduct electricity / heat • has a low melting point / boiling point • insoluble in water / soluble in organic solvents 	2
7(e)	sulfur dioxide is produced harmful effect of sulfur dioxide, e.g. acid rain / named effect of acid rain, e.g. corrodes metals / death of trees / kills organisms in lakes / irritation to lungs (or eyes / skin / nose / throat) /	1 1