Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CHEMISTRY **0620/33**

Paper 3 Core 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.

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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)	*test:* aluminium / magnesium / Devarda's alloy sodium hydroxide / strong alkali (and warm) *result:* 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**

Question	Answer	Marks
2(d)(i)	any 2 from: • 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)	*conditions required for ethanol manufacture by fermentation* (max = [3]) • 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 *conditions required for ethanol manufacture by hydration of ethene* (max = [3]) • uses high temperature / heat • uses a catalyst • uses high pressure • uses water / steam *equation* (max = [2]) • ethene + water / steam → ethanol • glucose → ethanol + carbon dioxide	**5**

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 (ºC) 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: • 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)	*in pure water:* blue *in a strongly acidic solution:* 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**

Question	Answer	Marks
5(a)(i)	endothermic because heating is needed	**1**
5(a)(ii)	arrow(s) pointing in both directions / ⇌	**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: • 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)	*test:* (aqueous) barium chloride / (aqueous) barium nitrate *result:* white precipitate / white solid	**1** **1**
5(d)(ii)	SiO_2 / Si_6O_{12}	**1**
5(e)(i)	pH 12	**1**
5(e)(ii)	H_2O	**1**
5(e)(iii)	any 3 from: • (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**

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: • density increases • melting / boiling point decreases • hardness decreases • reactivity increases	**2**
6(b)(i)	*from:* colourless / (light) green *to:* brown	**1** **1**
6(b)(ii)	iodine is more reactive than astatine **ORA**	**1**
6(c)(i)	H_2 (on left) 2(HC*l*) (on right)	**1** **1**
6(c)(ii)	one pair of bonding electrons between H and C*l* 6 non-bonding electrons around C*l* and none around H	**1** **1**
6(c)(iii)	lithium chloride water	**1** **1**

Question	Answer	Marks
7(a)	**A** condensation / condensing / condense **B** freezing / solidification	**1** **1**
7(b)	*arrangement:* regular *motion:* (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: • 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**