



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CHEMISTRY

0620/42

Paper 4 Theory (Extended)

March 2017

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 March 2017 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

© IGCSE is a registered trademark.

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 **6** printed pages.

Question	Answer	Marks
1(a)(i)	A	1
1(a)(ii)	B and C	1
1(a)(iii)	D	1
1(a)(iv)	A	1
1(a)(v)	A	1
1(a)(vi)	carbon dioxide and water	1
1(b)(i)	bitumen	1
1(b)(ii)	refinery gas	1
1(b)(iii)	refinery gas	1
1(b)(iv)	kerosene	1
1(b)(v)	heated / boiled / evaporated / vaporised	1

Question	Answer	Marks
2(a)	M1 filter	1
	M2 wash (the residue) using water	1
	M3 dry the residue between filter papers / in a warm place	1
2(b)(i)	2 ⁻	1
2(b)(ii)	$2\text{Ag}^+ + \text{Cr}_2\text{O}_7^{2-} \rightarrow \text{Ag}_2\text{Cr}_2\text{O}_7$	1
2(c)	M1 Universal Indicator turns blue	1
	M2 ammonia / NH_3 (is made)	1
2(d)(i)	M1 dichromate ions / particles are heavier (than silver ions)	1
	M2 so dichromate ions diffuse / move more slowly ORA	1
	M3 (where they meet they react and) silver dichromate is made	1
2(d)(ii)	M1 red solid forms in less than five minutes or red solid forms faster / sooner	1
	M2 particles / ions move faster	1
2(e)(i)	M1 breaking down	1
	M2 when heated	1

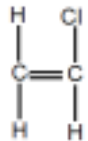
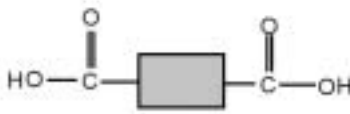
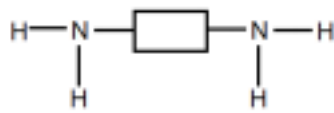
Question	Answer	Marks
2(e)(ii)	M1 formula of chromium(III) oxide	1
	M2 rest of equation correct to give a fully correct equation ($(\text{NH}_4)_2\text{Cr}_2\text{O}_7 \rightarrow \text{N}_2 + \text{Cr}_2\text{O}_3 + 4\text{H}_2\text{O}$ scores [2])	1

Question	Answer	Marks
3(a)	any 2 from: <ul style="list-style-type: none"> • forward and backward reactions occur at equal rates • amounts / moles / concentrations (of substances) remain constant • closed system 	2
3(b)	M1 (particles) have more energy OR (particles) move faster	1
	M2 more collisions per second OR greater collision rate	1
	M3 more (of the) particles / collisions have energy greater than the activation energy OR more particles / collisions have sufficient energy to react OR a greater percentage / proportion / fraction of collisions are successful	1
3(c)	M1 equilibrium moves left / yield decreases	1
	M2 because the forward reaction is exothermic OR because the reverse reaction is endothermic	1
3(d)	M1 no change	1
	M2 numbers of moles of gas on each side is the same	1
3(e)(i)	M1 all bonding pairs correct (two pair of electrons shared between O and N AND one pair of electrons shared between N and Cl)	1
	M2 four non-bonding electrons on O AND two non-bonding electrons on N AND six non-bonding electrons on Cl to give a fully correct diagram	1
3(e)(ii)	M1 weak forces (of attraction)	1
	M2 between molecules / intermolecular	1

Question	Answer	Marks
4(a)(i)	arrow labelled A on or near wire going in an anti-clockwise direction	1
4(a)(ii)	arrow labelled B in electrolyte pointing towards the cathode	1
4(b)(i)	electrons are lost	1
4(b)(ii)	M1 Cu^{2+} ions on left	1
	M2 rest of equation correct and correctly balanced ($\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$ scores [2])	1
4(c)	M1 anode mass decreases	1
	M2 copper lost as <u>ions</u> OR copper (atoms) becomes <u>ions</u> OR $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^-$	1
	M3 cathode mass increases	1
	M4 copper deposited / layer of copper forms / copper collected at cathode OR $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$	1

Question	Answer	Marks
5(a)	carbon dioxide <u>reacts</u> with carbon / coke OR $\text{CO}_2 + \text{C} \rightarrow 2\text{CO}$	1
5(b)	M1 $\text{CaO} + \text{SiO}_2 \rightarrow \text{CaSiO}_3$	1
	M2 CaO is a base	1
	M3 SiO_2 is an acid	1
5(c)(i)	(the carbon makes the iron too) brittle	1
5(c)(ii)	reacted with oxygen / oxygen blown in	1
5(d)(i)	zinc blende	1
5(d)(ii)	$2\text{ZnS} + 3\text{O}_2 \rightarrow 2\text{ZnO} + 2\text{SO}_2$	1
5(d)(iii)	any 2 from: <ul style="list-style-type: none"> • forms acid rain • kills trees / plants • kills fish • damages (limestone / marble) buildings / statues • causes breathing difficulties 	2
5(d)(iv)	M1 zinc boils	1
	M2 (both) impurities do not boil because their boiling point is above 1000 °C	1

Question	Answer	Marks
6(a)(i)	M1 (relative formula mass $\text{BaCO}_3 =$) 197	1
	M2 ($10.0/197 =$) 0.0508 (0.0508 alone scores [2])	1
6(a)(ii)	1.22	1
6(b)	2.24	1
6(c)(i)	0.00219	1
6(c)(ii)	M1 moles $\text{HCl} = 2 \times 0.00219$ OR correct evaluation of this (= 0.00438)	1
	M2 ($0.00438/0.01875$) = 0.234 (0.234 alone scores [2])	1

Question	Answer	Marks
7(a)(i)	circle drawn round two consecutive carbons which includes 3 H atoms and 1 Cl atom	1
7(a)(ii)		1
7(a)(iii)	M1 stays yellow / orange / brown or no change	1
	M2 becomes colourless	1
7(b)(i)	polyamide	1
7(b)(ii)	circle must include exactly two C=O, two N–H, one shaded square and one unshaded square	1
7(b)(iii)	M1 	1
	M2 	1

Question	Answer	Marks
7(c)(i)	M1 34.61/12 : 61.54/16 : 3.85/1 OR 2.885 : 3.846 : 3.85	1
	M2 2.885/2.885 : 3.846/2.885 : 3.85/2.885 OR 1 : 1.3(33) : 1.3(33) OR 3:4:4	1
	M3 $C_3O_4H_4$	1
7(c)(ii)	relative formula mass / relative molecular mass	1