



CHEMISTRY

0620/31

Paper 3 Theory (Core)

May/June 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 May/June 2017 series for most Cambridge IGCSE[®], Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

bestexamhelp.com

© 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 **7** printed pages.

Question	Answer	Marks
1(a)(i)	A	1
1(a)(ii)	E	1
1(a)(iii)	C	1
1(a)(iv)	B	1
1(a)(v)	C	1
1(b)	number of electrons in $\text{Br}^- = 36$	1
	number of neutrons in $\text{Cl} = 18$	1
	number of protons in $\text{Cl} = 17$ AND number of protons in $\text{Br}^- = 35$	1

Question	Answer	Marks
2(a)(i)	Na^+ / sodium	1
2(a)(ii)	sulfite / sulfate(IV)	1
2(a)(iii)	3 (mg)	1
2(a)(iv)	36.3 (mg)	1
2(a)(v)	calcium hydrogencarbonate	1
2(b)	flame test	1
	yellow	1
2(c)	MgCl_2	1

Question	Answer	Marks
2(d)	negative electrode: calcium / Ca	1
	positive electrode: chlorine / Cl ₂	1

Question	Answer	Marks
3(a)	<p>any 5 of:</p> <p>X has covalent bonding</p> <p>X particles are randomly arranged / irregularly arranged</p> <p>X particles are moving rapidly / freely / randomly / irregularly</p> <p>Y has ionic bonding / ionic</p> <p>Y particles are regularly arranged / lattice / in rows / uniformly arranged</p> <p>Y particles (only) vibrate / do not move from place to place</p> <p>Z has covalent bonding</p> <p>Z particles are regularly arranged / lattice / in a tetrahedral shape</p> <p>Z particles (only) vibrate / do not move from place to place</p>	5
3(b)	volume gets smaller	1
	particles get closer together	1
3(c)	drill tips / drills / cutting (tools)	1
3(d)	A / substance Y dissolves easily in water	1
	C / substance Y melts (at 8015 °C)	1
	the change can be reversed by altering the conditions	1

Question	Answer	Marks
4(a)	has two atoms in a molecule/two atoms combined	1
4(b)(i)	the chlorine has displaced/replaced the bromine (in KBr)	1
4(b)(ii)	(from green / colourless) to orange	1
4(b)(iii)	I ₂	1
	KBr	1
4(c)	add (nitric acid then aqueous) silver nitrate	1
	yellow precipitate	1
4(d)(i)	water purification / water treatment / killing bacteria / in (swimming) pools / disinfectant	1
4(d)(ii)	breaking down of a compound / breaking down of a substance	1
	(using) heat	1
4(d)(iii)	any 2 distinct pollution problems: <ul style="list-style-type: none"> • litter OR eyesore • sticks in gullets OR throats of birds / animals • blocking of drains OR watercourses • animals gets trapped OR tangled (in plastic) • poisonous vapours when burned • fills landfill sites 	2

Question	Answer	Marks
5(a)	circle drawn around the OH group	1
5(b)	20	1
5(c)	C=C double bond	1
5(d)(i)	increases with an increasing number of carbon atoms ORA	1
5(d)(ii)	any value between –88 and 0 (°C) (exclusive of these values)	1
5(d)(iii)	there is no (clear) trend/the numbers go down and up	1
5(d)(iv)	liquid	1
	30 °C is between melting and boiling point/30 °C is above the melting point and below the boiling point	1
5(d)(v)	substance containing carbon and hydrogen	1
	only / and no other element	1
5(d)(vi)	$ \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array} $	1
5(d)(vii)	3 (CO ₂)	1
	5 (O ₂)	1

Question	Answer	Marks
6(a)(i)	aluminium	
	low density	1
	good electrical conductivity	1
6(a)(ii)	iron is cheap(er)/tungsten is (too) expensive OR iron is strong(er)/tungsten is weaker	1
6(a)(iii)	tungsten because it has a (very) high melting point	1
6(b)	any 2 properties: <ul style="list-style-type: none"> • high melting point / high boiling point • high density • hard/strong • sonorous/rings (when hit) • ions are coloured/compounds are coloured 	2
6(c)	2 (W)	1
	3 (O ₂)	1
6(d)	tungsten < cobalt < iron < magnesium IF full credit is not awarded, allow 1 mark for either a correct sequence apart from a consecutive pair reversed OR for the whole sequence reversed	2
6(e)(i)	the more concentrated the acid, the greater the rate ORA	1
6(e)(ii)	nitric (acid)	1
6(e)(iii)	any value between 19 and 39 hours (exclusive of these values)	1
6(e)(iv)	pH 4	1

Question	Answer	Marks
7(a)	the energy of the reactants is greater than the energy of the products / the product has less energy than the reactants / the arrow is going down (from reactants to product)	1
7(b)	any 2 sources: <ul style="list-style-type: none"> • carbon monoxide from incomplete combustion of fossil fuels / named fossil fuel / named carbon-containing fuel • carbon dioxide from combustion of fossil fuels / respiration • methane from animal flatulence / rice paddy fields / bacteria / decomposition of vegetation / decomposition of animals any 3 effects: <ul style="list-style-type: none"> • carbon dioxide: global warming / greenhouse effect / acidification of oceans • methane: global warming / greenhouse effect • carbon monoxide: poisonous / toxic 	5
7(c)(i)	making mortar / whitewash / neutralising (acidic) soils / neutralising acidic lakes / flue gas desulfurisation / steelmaking / glassmaking / making plaster	1
7(c)(ii)	100 IF full credit is not awarded, allow 1 mark for (Ca =) 40, (C =) 12 and (O =) 16	2
7(d)	add hydrochloric acid to the mixture	1
	filter off the carbon	1
	wash carbon (with water or other solvent) AND dry in an oven / air dry / leave in air / leave to dry	1