GCSE MARKING SCHEME

SUMMER 2017

GCSE (NEW)
CHEMISTRY - UNIT 1

3410U10-1
3410UA0-1

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INTRODUCTION

This marking scheme was used by WJEC for the 2017 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

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GCSE CHEMISTRY
UNIT 1

MARK SCHEME

GENERAL INSTRUCTIONS

Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (apart from the questions where a level of response mark scheme is applied).

Question totals should be written in the box at the end of the question.

Question totals should be entered onto the grid on the front cover and these should be added to give the script total for each candidate.

Marking rules

All work should be seen to have been marked.

Marking schemes will indicate when explicit working is deemed to be a necessary part of a correct answer.

Crossed out responses not replaced should be marked.

Credit will be given for correct and relevant alternative responses which are not recorded in the mark scheme.

Extended response question

A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide which mark to award within the level. Award the higher mark in the level if there is a good match with both the content statements and the communication statements.

Marking abbreviations

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

cao	=	correct answer only
ecf	=	error carried forward
bod	=	benefit of doubt

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Foundation Tier only questions

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)	(i)		insoluble in water	1			1		1
		(ii)		alcohol and water have different boiling points ✓	1			1		1
		(iii)		evaporation / evaporating neutral answer: crystallisation / crystallising do not accept: boiling / distillation	1			1		1
	(b)	(i)		1 and 3 *either order*			1	1		1
		(ii)		2			1	1		1
		(iii)		0.5 (2) accept ½ award (1) for 4/8 if answer incorrect	1	1		2	2	
		(iv)		chromatography	1			1		
				Question 1 total	**5**	**1**	**2**	**8**	**2**	**5**

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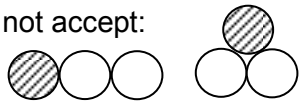
Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)			award (1) for every correct answer protons neutrons electrons protons	4			4		
	(b)	(i)		2		1		1		
		(ii)		4	1			1		
		(iii)		2,8,8,2	1			1		
		(iv)		3		1		1		
	(c)	(i)		hydrogen / H nitrogen / N oxygen / O carbon / C all 4 correct for (2) 2/3 correct for (1)			2	2		
		(ii)		 *atoms must be touching* do not accept: 		1		1		
	(d)	(i)		1	1			1		
		(ii)		8	1			1		
				Question 2 total	**8**	**3**	**2**	**13**	**0**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			melting point 60°C boiling point 780°C ✓			1	1	1	
	(b)	(i)		**B** **D** all four correct for (2) **C** two/three correct for (1) **A**			2	2		2
		(ii)		explosion / explosive / **more** violent (than rubidium) / **very** violent / trough smashes neutral answer: violent / more dangerous			1	1		1
		(iii)		any of following for (1) small piece of metal / excess water / a lot of water / use a trough / stand well back / safety screen / goggles / use tweezers / wear gloves / use a fume cupboard neutral answer: cover / glass protection	1			1		1
	(c)			Na_2O		1		1		
	(d)			**C**		1		1	1	
				Question 3 total	**1**	**2**	**4**	**7**	**2**	**4**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		large insoluble particles sink to the bottom ✓	1			1		
		(ii)		chlorine (1) kills bacteria / kills germs / sterilises water (1) accept: kill ≡ remove	2			2		
		(iii)		source (1) e.g. sewage / factory / industry / fertiliser / pesticides / herbicides / septic tank / farm animal slurry related mechanism (1) (sewage) leakage / (factory) accident / (factory) leakage / (fertiliser / pesticides / herbicides) run-off / (septic tank) leakage / (farm animal slurry) run-off	2			2		
	(b)	(i)		40 (2) award (1) for 180 if answer is incorrect allow ecf for miscalculated value >150		2		2	2	
		(ii)		it does not enter the body / is not consumed			1	1		
				Question 4 total	**5**	**2**	**1**	**8**	**2**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		81		1		1	1	
		(ii)		20 (2) award (1) for 10 **and** 30 read from graph if answer is incorrect		2		2	2	
	(b)	(i)		122.5 (2) award (1) for 39 + 35.5 + 3(16) if answer is incorrect		2		2	2	
		(ii)		32 / 31.8 (2) allow ecf from (i) award (1) for 39/122.5 if answer is incorrect		2		2	2	
	(c)			**2**KCl + **3**O_2 both needed		1		1	1	
				Question 5 total	**0**	**8**	**0**	**8**	**8**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6				**Indicative content** Fair test • use equal volumes of water samples / equal amounts / specified volume e.g. 5cm^3 • add soap solution 1cm^3 at a time / other specified volume / equal volumes at a time • shake 5 times / shake for 5 seconds / shake equal amounts • add soap solution until permanent lather is obtained / lather remains for 30 seconds Conclusion • **B** needs most soap solution, **A** needs least soap solution therefore **B** is hardest and **A** is softest		4	2	6		6
				5-6 marks All aspects of fair test **and** full conclusion *There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.* **3-4 marks** Partial fair test **and/or** partial conclusion *There is a line of reasoning which is partially coherent, largely relevant, supported by some evidence and with some structure. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.* **1-2 marks** Attempt at fair test statements **or** attempt at conclusion *There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with very little structure. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.* **0 marks** *No attempt made or no response worthy of credit.*						
				Question 6 total	**0**	**4**	**2**	**6**	**0**	**6**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)	(i)		thermal decomposition	1			1		1
		(ii)		3	1					1
		(iii)	I	(chip) expands / puffs-up / breaks-up (1) steam formed / spits / fizzes / bubbles (1) neutral answer: hisses	2			2		2
			II	$CaO + H_2O$ (1) $Ca(OH)_2$ (1) ignore attempts at balancing		2		2		
	(b)			turns milky / turns white / goes cloudy (1) carbon dioxide present / this is the test for carbon dioxide / we breathe out carbon dioxide / calcium carbonate formed (1) neutral answer: limewater is calcium hydroxide	2			2		2
	(c)			91 / 91.07 (2) award (1) for 5.1/5.6 if answer is incorrect no credit possible if 10 used in calculation		2		2	2	
				Question 7 total	**6**	**4**	**0**	**10**	**2**	**6**

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Common questions

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8/1	(a)			award (1) for every correct answer **A** and **C** both needed, either order **C** **B** **A** **D**	1 1 1	1 1		5		
	(b)	(i)		**3**		1		1		
		(ii)		**4**		1		1		
	(c)			both have 7 protons (and 7 electrons) (1) nitrogen-14 has 7 neutrons and nitrogen-15 has 8 neutrons (1) award (1) for general description of isotopes e.g. same number of protons, different number of neutrons		2		2		
				Question 8/1 total	**3**	**6**	**0**	**9**	**0**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9/2	(a)			62	1			1		1
	(b)			all points plotted accurately (2) ± 1 square ecf from (a) any 5 points plotted accurately (1) curve of best fit (1)		2	1	3	3	3
	(c)			curve to left of original (1) volume of carbon dioxide goes from 0 to 90 (1)			2	2	2	2
	(d)			more particles (1) greater ***chance*** of collisions / greater ***frequency*** of collisions / more collisions ***per second*** (1) neutral answer: more collisions higher rate (of reaction) / faster reaction (1)	3			3		
	(e)			downward curve from (0,179.80) (1) becomes horizontal at (40,179.63) (1)			2	2	2	2
				Question 9/2 total	**4**	**2**	**5**	**11**	**7**	**8**

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Higher Tier only questions

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		climate change affects the availability of drinking water ✓			1	1		
		(ii)		sheets contain holes which are bigger than water molecules but smaller than sodium and chloride ions ✓		1		1		
	(b)			4.2×10^6 (2) award (1) for $0.3/100 \times 1.4 \times 10^9$ if answer is incorrect ecf possible		2		2	2	
	(c)			(Sun's) heat / (Sun's) energy/ (Sun's) radiation (1) neutral answer: Sun water evaporates / water vapour forms (1) neutral answer: seawater evaporates / steam forms (water) vapour cools on dome / (water) vapour condenses on dome (1) distillation (1) accept desalination award (3) max if reference to boiling / 100 °C		2	2	4		
				Question 3 total	**0**	**5**	**3**	**8**	**2**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			award (1) mark for each linked 'action' **and** 'explanation' – (2) max if no credit awarded for linked action and explanation award (1) for two actions **or** two explanations action ……. explanation blasting dust blasting …….. noise (heavy) traffic / lorries ……. congestion / noise / air pollution more carbon dioxide / damage to buildings landscape destruction …… eyesore / unsightly / visual pollution habitat destruction …….. loss of wildlife agricultural land taken ….. less crops grown unsustainable ……. non-renewable resource promise of landscaping …. only takes place once quarry is depleted house prices fall …… linked to any of above	2			2		
	(b)			$CaCO_3 \rightarrow CaO + CO_2$		1		1		
	(c)			2/40 : 2.8/28 (1) 0.05 : 0.1 0.5 : 1 (1) 1 : 2 $CaSi_2$ (1)		3		3	1 1	
				Question 4 total	**2**	**4**	**0**	**6**	**2**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		any of following for (1) no more solid will dissolve (in the solvent / water / solution) solid remains (at bottom of beaker) accept: potassium nitrate ≡ solid	1			1		1
		(ii)		46.4 (2) award (1) for 11.6 g if answer is incorrect allow ecf for subtraction error		2		2	2	2
		(iii)		not all the water has been removed / solid is still wet (1) heat for longer / to a higher temperature (1) until constant mass (1)			3	3		3
		(iv)		temperature do not accept: volume of water			1	1		1
	(b)	(i)		11.9 (2) award (1) for 32 or 87.8 if answer is incorrect allow ecf for multiplication error		2		2	2	2
		(ii)		0.54 (2) do not accept: 0.5 / 0.538 award (1) for 119 as M_r(KBr) allow ecf for M_r error		2		2	2	
				Question 5 total	**1**	**6**	**4**	**11**	**6**	**9**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)			straight line from anywhere along the top of Li bar to anywhere along the top of Cs bar – *ruler must be used* (1) potassium value further from the line than the sodium value (1) *accept numerical values for each metal*			2	2	2	
	(b)	(i)		similarity: observation (1) …… reason (1) both float …… densities less than water / less than 1 both form bubbles / fizz …….. (hydrogen) gas formed both move (about)……. (hydrogen) gas formed do not accept: both melt / ball shape difference: observation (1) …… reason (1) potassium burns, lithium doesn't……. more exothermic / more reactive potassium moves about more ……. more reactive potassium melts, lithium doesn't …….. lithium has higher melting point neutral answer: potassium reacts more violently	4			4		4
		(ii)		reactants: Li + O_2 (1) product: Li_2O (1) balancing: **4**Li + O_2 → **2**Li_2O (1) *only award balancing mark if the formulae of reactants and products are correct*		3		3	1	

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(iii)		any three of following for (1) each • potassium's outer shell electron furthest away from nucleus • least attraction / electron most easily lost • chlorine's outer shell closest to nucleus • greatest attraction / electron most easily gained allow (1) for 'reactivity increases down Group 1 and decreases down Group 7' if no other mark awarded	3			3		
				Question 6 total	**7**	**3**	**2**	**12**	**3**	**4**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)	(i)		hard water contains calcium ions / Ca^{2+} / magnesium ions / Mg^{2+} (1) (Ca^{2+} / Mg^{2+}) swap places with sodium / Na^{+} ions (1) accept: swap ≡ change ≡ replaces ≡ exchanges neutral answer: displaces reference to 'ions' needed only once	2			2		2
		(ii)		all Na^{+} ions have been removed / no more Na^{+} ions left (1) any soluble sodium salt e.g. sodium chloride (1) accept: salt solution	2			2		2
	(b)			add soap solution and shake (1) soft water forms lather (1) boil & add soap solution and shake / boil & repeat method (1) temporary hard water forms lather and permanent hard water doesn't (1)	4			4		4
				Question 7 total	**8**	**0**	**0**	**8**	**0**	**8**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8	(a)	(i)		**A** lithium chloride / LiCl **B** sodium bromide / NaBr **C** potassium iodide / KI all correct for (2) any one correct for (1) if no compound correctly identified, award (1) for three correct metals or (1) for three correct halides ignore incorrect formulae if compound names given			2	2		2
		(ii)		$Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$ reactants: $Ag^+ + Cl^-$ (1) product: AgCl (1) state symbols (1) *only award state symbols mark if the formulae of reactants and products are correct*	1	2		3		

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)			**W** chlorine / Cl_2 **X** bromine / Br_2 **Y** iodine / I_2 **Z** fluorine / F_2 all correct for (2) any two correct for (1) award (1) if halide ions given instead of halogens		2		2		2
	(c)			reactants **and** products: $Fe + F_2$ **and** FeF_3 (1) balancing: 2 : 3 : 2 (1) *only award balancing mark if the formulae of reactants and products are correct*		2		2	1	
				Question 8 total	**1**	**6**	**2**	**9**	**1**	**4**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9				**Indicative content** Destructive plate boundary • oceanic and continental plates moving towards one another • more dense oceanic plate forced under less dense continental plate • friction causes earthquakes, subducted plate melts, rising magma forms volcanoes, mountain building • example named or shown on diagram Constructive plate boundary • plates move apart • magma wells up to fill gap • new igneous rock forms, sea-floor spreading • example named or shown on diagram Reference to conservative boundaries is irrelevant	6			6		
				5-6 marks Both boundary types discussed, good detail for both *There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.* **3-4 marks** Some detail relating to both types or one type with good detail *There is a line of reasoning which is partially coherent, largely relevant, supported by some evidence and with some structure. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.* **1-2 marks** Some detail relating to one type *There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with very little structure. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.* **0 marks** *No attempt made or no response worthy of credit.*						
				Question 9 total	**6**	**0**	**0**	**6**	**0**	**0**

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FOUNDATION TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	5	1	2	8	2	5
2	8	3	2	13	0	0
3	1	2	4	7	2	4
4	5	2	1	8	2	0
5	0	8	0	8	8	0
6	0	4	2	6	0	6
7	6	4	0	10	2	6
8	3	6	0	9	0	0
9	4	2	5	11	7	8
TOTAL	32	32	16	80	23	29

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HIGHER TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	3	6	0	9	0	0
2	4	2	5	11	7	8
3	0	5	3	8	2	0
4	2	4	0	6	2	0
5	1	6	4	11	6	9
6	7	3	2	12	3	4
7	8	0	0	8	0	8
8	1	6	2	9	1	4
9	6	0	0	6	0	0
TOTAL	32	32	16	80	21	33

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