



GCSE MARKING SCHEME

SUMMER 2017

**GCSE (NEW)
DOUBLE AWARD SCIENCE UNIT 2 - CHEMISTRY 1**

3430U20-1

3430UB0-1

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.

**GCSE DOUBLE AWARD SCIENCE
UNIT 2 - CHEMISTRY 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

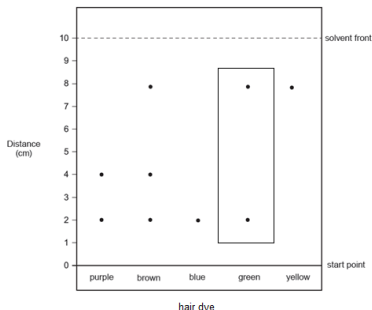
The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

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

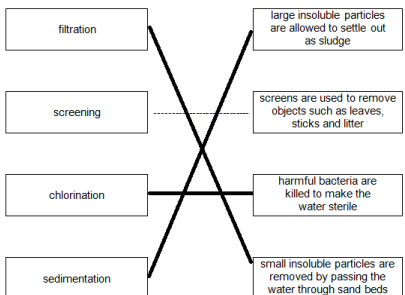
GCSE Double Award Science Unit 2 - Chemistry 1

Mark Scheme

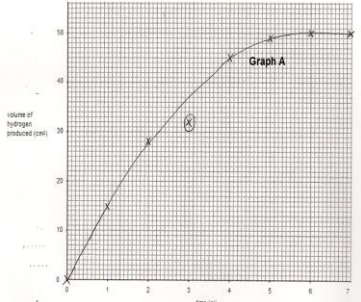
Foundation Tier only questions

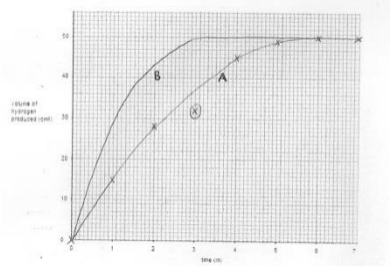
Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)	(i)		B		1		1		1
		(ii)		C		1		1		1
	(b)	(i)		purple and yellow (both needed)			1	1		1
		(ii)		 both spots needed		1		1		
		(iii)		4 (2) working not needed award (1) for reference to solvent distance being 10 cm	1	1		2	2	
				Question 1 total	1	4	1	6	2	3

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)		1	1			1		
		(ii)		6	1			1		
	(b)			8.69% / 8.7% / 9% (2) award (1) for $M_r(\text{K}_2\text{CO}_3) = 138$ allow ecf from (a)(i) – i.e. correct method and calculations based on 3 carbon atoms and 8 atoms in total		2		2	2	
				Question 2 total	2	2	0	4	2	0

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		 all correct for (2) any one correct for (1)	2			2		
		(ii)	I	13		1		1	1	
			II	bathing accept 21 %		1		1	1	
	(b)	(i)		<u>hardest</u> <u> A </u> <u> C </u> <u>softest</u> <u> B </u> assume C is in the correct position if A and B are correct			1	1		1
		(ii)		B – no credit on its own but needed for the explanations boils at (exactly) 100°C (1) produces the most froth / softest water (1) no credit for reasons if A or C is given			2	2		2

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
		(iii)		shaking the mixture / tube (1) shake a set number of times / for a specified length of time (1) award (1) only for reference to water temperature, type of soap, concentration of soap	2			2		2
		(iv)		CaF ₂		1		1		
				Question 3 total	4	3	3	10	2	5

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			fizzing / bubbling / effervescence (1) magnesium used up / gets smaller / disappears (1) neutral answers: exothermic / gas forms / hydrogen forms	2			2		2
	(b)			$\text{Mg} + 2\text{HCl} \longrightarrow \text{MgCl}_2 + \text{H}_2$ correct reactants (1) correct products (1) balancing (1) – can only be awarded if both the reactants and products are correct		3		3	1	
	(c)	(i)		 all plots correct (2) tolerance ± ½ square any 5 plots correct (1) curve missing out point at 3 minutes (1) no credit for joining points using a ruler		2		1	3	3

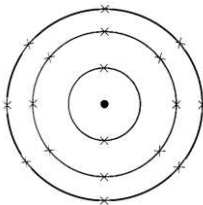
Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)	I	21 / 22 cm ³ (accept without unit) accept alternative answers correctly read from the graph	1			1	1	1
			II	6 minutes / min(s) unit needed accept correct answer in seconds / minutes and seconds accept alternative values between 5 and 6 minutes based on graph		1		1	1	1
		(iii)		 steeper gradient (1) reaching same end point in less time (1)			2	2		2
				Question 4 total	3	6	3	12	6	6

Question				Marking details	Marks Available														
					AO1	AO2	AO3	Total	Maths	Prac									
5	(a)			The melting point increases ☒ The melting point decreases ☐ The melting point increases and then decreases ☐ There is no trend in the melting point ☐		1		1											
	(b)			CL2 Cl₂ ✓ cl₂ 2Cl	1			1											
	(c)			any value between –100°C and 19°C (1) above melting point / –101°C and below room temperature / 20°C (1) accept between melting point and room temperature for second mark			2	2	2										
	(d)			poisonous / toxic	1			1											
	(e)			<table><tr><th>Statement about astatine</th><th>True / False</th></tr><tr><td>Is a solid at room temperature</td><td>True</td></tr><tr><td>Will conduct electricity</td><td>False</td></tr><tr><td>Has a melting point higher than 114°C</td><td>True</td></tr><tr><td>Is coloured</td><td>True</td></tr></table> all correct for (2) any 2 correct for (1)	Statement about astatine	True / False	Is a solid at room temperature	True	Will conduct electricity	False	Has a melting point higher than 114°C	True	Is coloured	True			2	2	
Statement about astatine	True / False																		
Is a solid at room temperature	True																		
Will conduct electricity	False																		
Has a melting point higher than 114°C	True																		
Is coloured	True																		
				Question 5 total	2	1	4	7	2	0									

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6				Indicative content flame test – wire/damp splint dipped in compounds and placed in roaring flame - potassium bromide gives lilac flame - barium chloride gives apple-green flame - calcium iodide gives brick-red flame silver nitrate test – dissolve some of each compound in a small amount of water and add silver nitrate solution - potassium bromide gives cream precipitate - barium chloride gives white precipitate - calcium iodide gives yellow precipitate	6			6		
				5-6 marks Both tests given, basic description, correct observations linked to correct compounds <i>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.</i> 3-4 marks Complete account of one test with correct observations for all ions or partial account of both with some correct observations linked to correct compounds <i>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.</i> 1-2 marks Partial account of one test with one correct observation linked to correct compound <i>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.</i> 0 <i>No attempt made or answer worthy of any credit.</i>						
				Question 6 total	6	0	0	6	0	4

Common questions

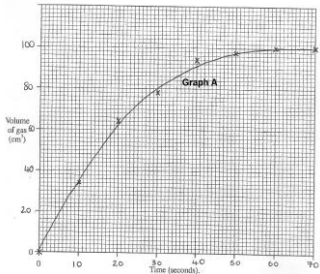
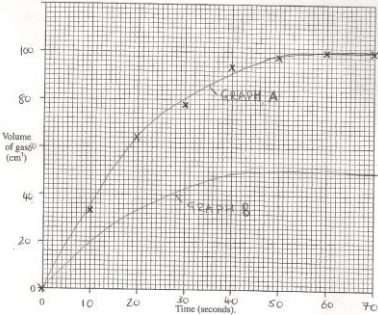
Question				Marking details	Marks Available												
					AO1	AO2	AO3	Total	Maths	Prac							
7/1	(a)	(i)		less carbon dioxide today / carbon dioxide has decreased (1) now contains oxygen / oxygen has formed / oxygen has increased / more oxygen today (1) award (1) for numerical value given for the present day percentage of either gas e.g. 21% oxygen, 0.04% carbon dioxide (or correctly calculated change from pie chart)	3			3									
		(ii)	<table border="1"><thead><tr><th>gas</th><th>test carried out</th><th>expected observation</th></tr></thead><tbody><tr><td>hydrogen</td><td>put a <u>lit splint</u> into the gas</td><td>there is a squeaky <u>pop</u> and the splint goes out</td></tr><tr><td>carbon dioxide</td><td>bubble the gas through <u>limewater</u></td><td>the limewater goes from clear to <u>milky</u></td></tr></tbody></table> award (1) for each correct test and observation award (1) if both tests given but incorrect observation(s)	gas	test carried out	expected observation	hydrogen	put a <u>lit splint</u> into the gas	there is a squeaky <u>pop</u> and the splint goes out	carbon dioxide	bubble the gas through <u>limewater</u>	the limewater goes from clear to <u>milky</u>	2			2	
	gas	test carried out	expected observation														
	hydrogen	put a <u>lit splint</u> into the gas	there is a squeaky <u>pop</u> and the splint goes out														
carbon dioxide	bubble the gas through <u>limewater</u>	the limewater goes from clear to <u>milky</u>															
(b)	(i)		(average global) temperatures have increased (1) (average global) temperatures have increased by greater amounts over time / have increased exponentially (2)		1		2	2									
	(ii)		3.60% (2) accept 3.59 / 3.597 / 4.0 award (1) for reference to an increase of 10 ppm ecf possible for incorrect subtraction		2		2	2									
				Question 7/1 total	5	3	1	9	4	2							

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
8/2	(a)	(i)		E	1			1		
		(ii)		D		1		1		
		(iii)	C and E (1) both needed same number of protons (atomic number) but different number of neutrons (mass number) (1)	1	1		2			
	(b)	(i)			1		1			
		(ii)	full outer shell (of electrons) accept both have 8 electrons in their outer shell	1			1			
				Question 8/2 total	3	3	0	6	0	0

Higher Tier only questions

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			Samples A, B and C contain magnesium or calcium ions ☒ Only samples A and B contain magnesium or calcium ions ☐ Only samples B and C contain magnesium or calcium ions ☐ None of the samples contain magnesium or calcium ions ☐			1	1		
	(b)			To show the expected result for permanent hard water ☐ To show the expected result for temporary hard water ☐ To act as a control for the experiment ☒ To make sure the investigation is a fair test ☐	1			1		1
	(c)			volume of soap solution and number of times shaken ☐ volume of water sample and volume of soap solution used ☐ volume of water sample and number of times shaken ☒ volume of water sample, volume of soap solution and number of times shaken ☐	1			1		1
	(d)			Sample B contains temporary hardness only ☐ Sample B contains permanent hardness only ☐ Sample B contains a mixture of temporary and permanent hardness ☒ Sample B does not contain hardness ☐ the volume of soap needed after boiling is less than before / less soap is needed after boiling (1) the volume of soap after boiling is still more than the distilled water (1)			3	3		3

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
	(e)			if answered yes accept any two of following for (1) each • strengthens bones / teeth • reduced chance of heart disease • better for baking / brewing industry • improves flavour of water if answered no accept any two of following for (1) each • forms a scum with soap / wastes soap • furs up kettles / pipes / forms limescale • appliances become less efficient (or named appliance) • bad taste / tastes different if answered 'unable to decide' must have one reason in favour and one against to gain (2) if no opinion is stated, credit may still be awarded if the reasons clearly imply an opinion neutral: reference to cost / calcium / magnesium accept other creditworthy answers	2			2		
				Question 3 total	4	0	4	8	0	5

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			 appropriate scale (1) all points plotted correctly (1) tolerance $\pm\frac{1}{2}$ square suitable curve (1) do not accept points joined with ruler [assume graph A is the graph that is plotted]		3		3	3	3
	(b)			 curve to the right of graph A (1) levelling off at 50cm³ (1)			2	2	2	2

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)			(higher temperature means) the particles have <u>more kinetic energy / move faster</u> (1) this means there is a <u>greater frequency / chance of successful collisions</u> (1)	2			2		
	(d)			repeat the experiment / get more than one set of results / compare results with another group (1) take mean of <u>repeatable / concordant / consistent</u> results (1) accept 'reproducible' and 'reliable' results			2	2		2
	(e)			advantage – award (1) for any of following - no time delay in connecting the syringe - all of the gas produced is collected from the flask - none of the gas escapes before the syringe is connected - measuring cylinder scale is more precise than the syringe disadvantage – award (1) for any of following - measuring cylinder scale is less precise than the syringe - difficult to read the volume in the cylinder – moving water surface - some of the gas may not end up in measuring cylinder - tube may move from under the measuring cylinder NB – precision of the scale can only be credited once neutral: reference to stability or ease of setting up apparatus			2	2		2
				Question 4 total	2	3	6	11	5	9

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		A FeCl ₃ (1) B NaCl (1) C Br ₂ (1) award (1) for correct names of all three substances		3		3		
		(ii)		<u>fume cupboard</u> – because <u>chlorine / bromine / halogen</u> fumes are <u>toxic</u> three parts needed neutral: reference to goggles or general laboratory safety or fumes in general	1			1		1
		(iii)		no reaction / no change / no observable change (1) iodine is less reactive than bromine (1) and is therefore unable to <u>displace the bromide / bromine</u> (from the solution/sodium bromide) (1) neutral: iodine less reactive than chlorine gains no credit	2	1		3		3

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)			ClO_2 (3) if formula incorrect award credit for correct steps $Cl = \frac{0.71}{35.5}/0.02$ and $O = \frac{0.64}{16}/0.04$ (1) conversion of 0.02 and 0.04 to a 1:2 ratio (1) ecf possible award (1) max if A_r divided by mass leading to Cl_2O		3		3	3	
	(c)	(i)		$\text{Ag}^+(\text{aq}) + \text{Br}^-(\text{aq}) \rightarrow \text{AgBr}(\text{s})$ correct formulae for both ions and product (1) state symbols for both ions and product (1) state symbols only credited if ions and product correct	1	1		2		
		(ii)		$2\text{AgNO}_3 + \text{CaI}_2 \rightarrow 2\text{AgI} + \text{Ca}(\text{NO}_3)_2$ correct reactants (1) correct products (1) balancing (1) balancing mark can only be awarded if both the reactants and products are correct		3		3	1	
				Question 5 total	4	11	0	15	4	4

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)			0.992g / 0.99g (3) if answer incorrect allow credit for correct working 4 (23) Na / 92g Na (1) $\Rightarrow$ 2 (62) Na ₂ O / 124g Na ₂ O (1) allow ecf alternative method 0.032 mol Na (1) 0.016 mol Na ₂ O (1) allow ecf		3		3	3	3
	(b)	(i)		34.07% / 34.1% / 34% allow ecf from part (a)		1		1	1	1
		(ii)		award (1) for any of following - sodium was tarnished / oxidised already / some of the sodium had already reacted - insufficient burning time / not all reacted - not enough oxygen used - other reactions (or named) had taken place neutral - some product was spilled - incorrect measurements			1	1		1
				Question 6 total	0	4	1	5	4	5

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
7				Indicative content Description - the metals get more reactive / react more violently as you go down the group - lithium fizzes and moves slowly on water surface - sodium fizzes, moves quickly on surface, forms a ball and melts - potassium fizzes, moves quickly on surface, forms a ball, melts and ignites burning with a lilac flame Explanation - the metals all have one electron in their outer electron shell - they lose this outer electron when they react - as you go down the group, the outer electron gets further away from the nucleus, meaning it is easier to lose - the more easily the outer electron is lost, the more reactive the metal is	6			6		3
				5-6 marks Full description of the observations and explanation of trend in terms of ease of losing outer electron <i>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.</i> 3-4 marks Good account of the observations, correct trend and reference to electronic structure <i>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.</i> 1-2 marks Basic description of some observations and/or trend <i>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.</i> 0 <i>No attempt made or answer worthy or any credit.</i>						
				Question 7 total	6	0	0	6	0	3

Foundation Tier

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	1	4	1	6	2	3
2	2	2	0	4	2	0
3	4	3	3	10	2	5
4	3	6	3	12	6	6
5	2	1	4	7	2	0
6	4	2	0	6	0	4
7	5	3	1	9	4	2
8	3	3	0	6	0	0
TOTAL	24	24	12	60	18	20

Higher Tier

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	5	3	1	9	4	2
2	3	3	0	6	0	0
3	4	0	4	8	0	5
4	2	3	6	11	5	9
5	4	11	0	15	4	4
6	0	4	1	5	4	5
7	6	0	0	6	0	3
TOTAL	24	24	12	60	18	28