GCSE MARKING SCHEME

SUMMER 2018

GCSE (NEW)
SCIENCE (DOUBLE AWARD) - UNIT 5

3430U50-1
3430UE0-1

INTRODUCTION

This marking scheme was used by WJEC for the 2018 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 SCIENCE (DOUBLE AWARD) UNIT 5 – CHEMISTRY 2

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

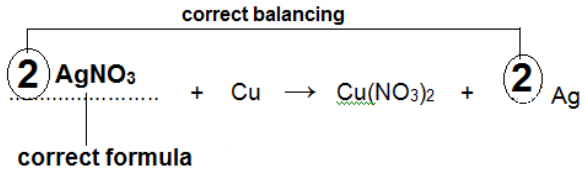
The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

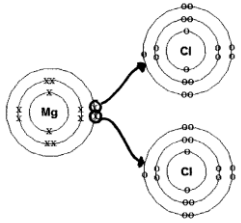
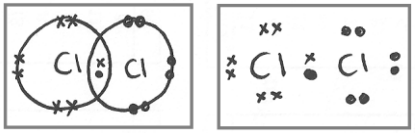
cao	=	correct answer only
ecf	=	error carried forward
bod	=	benefit of doubt

Foundation Tier only questions

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)	(i)		water / H_2O	1			1		
		(ii)		displacement **neutralisation** oxidation reduction do not award if more than one word selected	1			1		1
	(b)	(i)		**1** and **3** / 4 : 28s and 4 :32			1	1	1	1
		(ii)		270 do not accept answers that have **not** used the mean value		1		1	1	
		(iii)		takes the least amount of time / is the fastest (to turn the indicator green / neutralise the acid)			1	1		1
				Question 1 total	**2**	**1**	**2**	**5**	**2**	**3**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)		(a reaction that) gives out / releases heat accept 'temperature increases'	1			1		1
		(ii)	I	aluminium / Al do not accept aluminium oxide		1		1		
			II	accept any of following • removal of oxygen • loss of oxygen • to take away oxygen accept correct reference to gain of electrons	1			1		
		(iii)		aluminium is more reactive than chromium / chromium is less reactive than aluminium accept aluminium is more reactive / chromium is less reactive		1		1		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)	(i)		colour change / goes blue – due to <u>copper nitrate</u> (1) <u>silver</u> (metal) forms / <u>silver</u> (metal) coats the copper (1) award (1) for reference to colour change **and** metal/solid forming without naming products references to exothermic / fizzing are neutral			2	2		2
		(ii)		 award (1) for correct formula for silver nitrate award (1) for correct balancing only if formula is correct accept $Ag(NO_3)$ as correct formula		2		2	1	
				Question 2 total	**2**	**4**	**2**	**8**	**1**	**3**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		 both electrons must be transferred, both must go to the outer shells		1		1		
		(ii)		2,8 / $(2,8)^{2+}$ (1) – / 1– (1) neutral answer –1		2		2		
	(b)	(i)		 must have shared pair and total of 8 electrons around both atoms ignore electrons in any inner shells drawn		1		1		
		(ii)		covalent (bonding) reference to simple molecular / sharing electrons is neutral	1					
				Question 3 total	**1**	**4**	**0**	**5**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		(remains) **marine** life / animals / plants (1) over millions of years / because of pressure / decompose in absence of oxygen (1)	2			2		
		(ii)		will run out / won't last forever / finite / cannot be replaced cannot be used again – neutral	1			1		
	(b)	(i)		distillation (1) accept any of following for (1) • boiling point • boiling temperature • sized molecules / chain length • different forces between molecules different temperature / different molecules / different melting point – neutral	2			2		
		(ii)		**mixture** **element** **compound**	1			1		
	(c)			84 / 83.7 / 83.72 (2) award (1) for 83 award (1) for M_r 86 allow ecf from incorrect M_r		2		2	2	

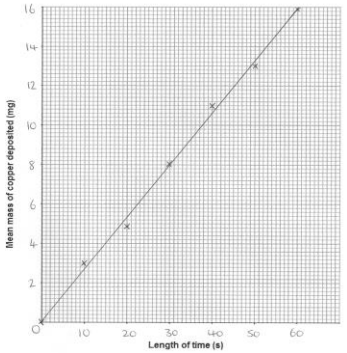
Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)	(i)		**B**		1				
		(ii)		**A C D** − all **three** needed (1) **B E** − **both** needed (1) award (1) for one correct structure given in **both** parts		2		2	1	
	(e)			linked method **and** problem required burning / incineration – releases poisonous gases / toxic fumes / CO_2 which causes global warming (1) send to landfill / bury – space running out / does not decompose / non-biodegradable (1) award (1) for two correct methods if insufficient descriptions of the problems	2			2		
				Question 4 total	**8**	**5**	**0**	**13**	**3**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			any of following • they all burn the same • they all burn very easily • there is no difference between them			1	1		
	(b)			A B C ☐ A C B ☐ B A C ☐ B C A ✓ C A B ☐ C B A ☐			1	1		
	(c)			All of the fuels contribute to acid rain and global warming when they burn ☐ Fuels A and C contribute to acid rain and global warming when they burn ☐ Only fuel C contributes to acid rain and global warming when it burns ✓ (1) None of the fuels contribute to acid rain and global warming when they burn ☐ sulfur dioxide **and** carbon dioxide released when it burns accept '**C** is the **only** one that produces SO_2' (1)	1		1	2		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)			245 (2) if incorrect award (1) for $\frac{44.1}{0.18}$	1	1		2	2	
	(e)			<table><tr><td></td><td>(✓)</td></tr><tr><td>Fuel C will run out after fuels A and B</td><td></td></tr><tr><td>Fuel C is easier to store than fuel A</td><td></td></tr><tr><td>Fuel A burns more easily than fuel C</td><td></td></tr><tr><td>Fuel B is the cleanest fuel</td><td>✓</td></tr><tr><td>Fuel B is easier to store than fuel C</td><td></td></tr><tr><td>Fuel B will never run out</td><td>✓</td></tr><tr><td>Fuel A is less harmful to the environment than fuel C</td><td>✓</td></tr><tr><td>Fuel A is less cost effective than fuel B</td><td>✓</td></tr></table> award (2) for all four correct award (1) for any two correct if more than four ticks, each additional one cancels out a correct tick e.g. five ticks – credit max three ticks i.e. 1 mark six ticks – credit max two ticks i.e. 1 mark			2	2		
				Question 5 total	**2**	**1**	**5**	**8**	**2**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6				**Indicative content** Stage 1 • excess copper(II) carbonate added to the sulfuric acid (description) • to ensure all of the acid is used up / neutralised (explanation) • fizzing / solution turns blue (description) • CO_2 formed (explanation) • word equation / symbol equation (explanation) Stage 2 • mixture is filtered (description) • excess copper(II) carbonate is removed (explanation) Stage 3 • solution is heated / left in a warm place / left on windowsill (description) • water evaporates / copper(II) sulfate crystals form (explanation)	6			6		6
				5-6 marks Good description of all three stages, including explanations and equation *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** Basic description of all three stages, attempt at explanation *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** Basic description of the process *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	**6**	**0**	**0**	**6**	**0**	**6**

Common questions

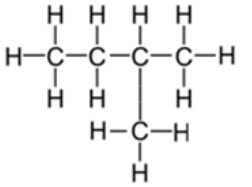
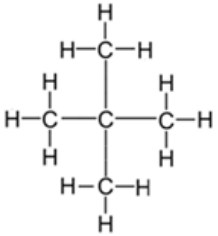
Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7/1	(a)			 award (2) for all points plotted correctly – tolerance ±½ square award (1) for any four correct points award (1) for straight line through origin do not accept point to point line		3		3	3	3
	(b)	(i)		2.5 (2) ignore +/− if incorrect award (1) for correct workings e.g. $\frac{8.2-8.0}{8.0} \times 100$ **or** $\frac{7.8-8.0}{8.0} \times 100$ **or** $\frac{0.2}{8.0} \times 100$	1	1		2	2	2
		(ii)		some of the copper fell to the bottom of the beaker / some copper was left in the beaker time too long or too short – neutral some copper was left on the electrode – neutral reference to concentration of solution – neutral			1	1		1

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)	(i)	I	aluminium ions are positively charged and cathode is negative (1) opposites attract / move to opposite charge / gain three electrons from the cathode (1) aluminium 'atoms' – do not credit for first mark but second mark possible	2			2		
			II	$2\ Al_2O_3 \rightarrow 4\ Al + 3\ O_2$ both products (1) correct balancing (1) balancing mark can only be awarded if both products are correct		2		2	1	
		(ii)		K_2CO_3		1		1		
				Question 7/1 total	**3**	**7**	**1**	**11**	**6**	**6**

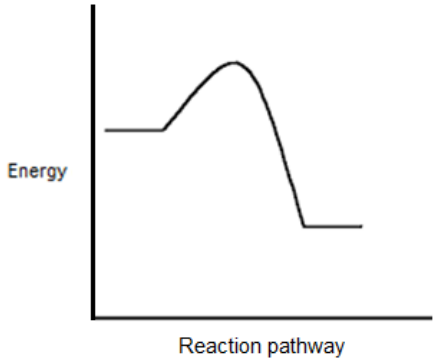
Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8/2	(a)			3466 (2) if incorrect award (1) for indication of correct bonds formed e.g. (4 × O—H) and (2 × C=O) / (4 × 464) and (2 × 805)		2		2	2	
	(b)			818 / −818 (1) ecf possible from part (a) award (1) for any of following explanations • more energy is released than taken in • more energy out than energy in • energy out is bigger than energy in • overall change is negative (if −818 calculated)		2		2	1	
				Question 8/2 total	**0**	**4**	**0**	**4**	**3**	**0**

Higher Tier only questions

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			award (1) for any of following • the longer the chains, the higher the boiling point • the more carbon atoms, the higher the boiling point • the larger the molecules, the higher the boiling point • the larger M_r, the higher the boiling point the higher the boiling point, the lower in the column the fraction is collected (1) accept converse argument throughout e.g. the shorter the chains, the lower the boiling point etc. if **no** reference to boiling point award (1) for 'the bigger the molecule, the lower down the column it collects'	2			2		
	(b)	(i)		C_4H_8		1		1	1	
		(ii)		any **two** of following • **high** temperature / heat **strongly** • catalyst • absence of air ignore any reference to pressure – neutral answer	1			1		
		(iii)		any of following • small(er) fractions are more useful / used as fuels • more demand for small(er) fractions • produces alkenes / unsaturated molecules • conserves crude oil supplies • produces **monomers** to make plastics	1			1		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)	(i)		**same** molecular formula but **different** structural formulas	1			1		
		(ii)		award (1) for each correct isomer  	2			2		
	(d)			1.2 g of hydrogen (1) $C = \frac{7.2}{12}/0.6$ and $H = \frac{1.2}{1}/1.2$ (1) 1:2 ratio / alkenes have the general formula C_nH_{2n} / alkenes always have double the hydrogen to carbon (1) third mark to be awarded only if the correct ratio is found		2	1	3	2	
				Question 3 total	**7**	**3**	**1**	**11**	**3**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		**Agree** because we are not told / do not know that the carbonate is in excess (1) there may not be enough to neutralise all of the acid (1) OR **Disagree** because the carbonate will be in excess (1) so all of the acid will all be used up / neutralised (1) **no credit** if no choice is made and the answer does not mention agreeing or disagreeing	2			2		2
		(ii)		$K_2CO_3 + 2HCl \rightarrow 2KCl + CO_2 + H_2O$ reactants (1) products (1) balancing (1) balancing mark can only be awarded if both the reactants and products are correct		3		3	1	

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)	(i)		will overshoot / go past the point of neutralisation / endpoint 'too much acid' is a neutral answer	1			1		1
		(ii)		$H^+ + OH^- \rightarrow H_2O$ (1) charges on ions **must** be present H^+ comes from the (sulfuric) acid and OH^- comes from the (potassium) hydroxide / alkali (1) 'one comes from the acid and the other from the alkali' and 'they come from the acid and alkali' are neutral answers	2			2		
		(iii)			1			1		

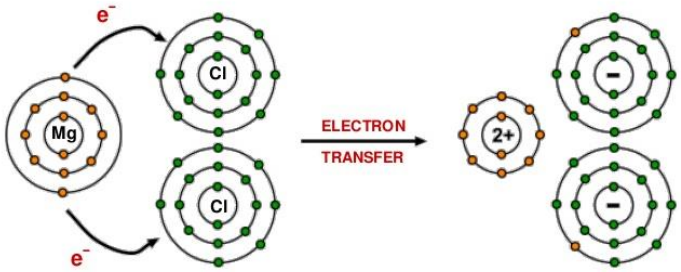
Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)	(i)		both will give a lilac flame / same colour flame (because both contain the potassium ions / K^+ / potassium)			1	1		1
		(ii)		add silver nitrate solution / $AgNO_3(aq)$ (1) potassium chloride gives a (white) **precipitate** whereas potassium sulfate gives no precipitate / only the chloride gives a (white) **precipitate** (1) OR add barium chloride solution / $BaCl_2(aq)$ (1) potassium sulfate gives a (white) **precipitate** whereas potassium chloride gives no precipitate / only the sulfate gives a (white) **precipitate** (1)		1	1	2		2
				Question 4 total	**6**	**4**	**2**	**12**	**1**	**6**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		mass of copper produced = 1.39g (1) second mark awarded for working showing yield to be 109% yield = $\frac{1.39}{1.27} \times 100 = 109\%$ (1) no ecf possible		2		2	2	2
		(ii)		the copper(II) oxide / charcoal was impure / some charcoal reacts with the air / not all the copper(II) oxide reacted / charcoal in excess accept 'not enough charcoal to reduce all of the copper(II) oxide' reference to heat or time is neutral			1	1		1
	(b)	(i)		accept reduction by carbon monoxide or carbon $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$ $2Fe_2O_3 + 3C \rightarrow 4Fe + 3CO_2$ reactants and products (1) balancing (1) balancing mark can only be awarded if both the reactants and products are correct	2			2		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		7.7×10^4 (3) 77000 (2) if answer incorrect credit each of following $\frac{22}{100} \times (5 \times 10^5)$ or 1.1×10^5 (1) $\frac{112}{160} \times (1.1 \times 10^5)$ or $0.7 \times (1.1 \times 10^5)$ (1) ecf possible		3			3	
				Question 5 total	**2**	**5**	**1**	**8**	**5**	**3**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)			The oils contain saturated fats only ☐ The oils contain unsaturated fats only ☐ The oils contain both saturated and unsaturated fats ✓ It is not possible to tell whether the oils contains saturated or unsaturated fats ☐			1	1		1
	(b)			it reacts with the unsaturated fats (1) bromine atoms attach to the molecule / carbon chain / add across the double bond / an addition reaction takes place (1) marking points are not linked	2			2		2

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)			$\frac{9.9}{40} \times 100$ or $\frac{30.1}{40} \times 100$ (1) contains 25% saturated fat / 75% unsaturated fat (1) therefore the statement is incorrect (1) third marking point is linked – can only be awarded if the correct answer is given alternative methods possible e.g. 10% unsaturation equivalent to approximately 4cm^3 of bromine water (1) 30cm^3 of bromine water equivalent to 75% unsaturation (1)			3	3	2	3
	(d)			(despite having more than 15% saturated fat) it still contains the lowest percentage of saturated fat / has the highest percentage of unsaturated fat (1) award (1) for either of following • less likely to cause heart disease • more likely to lower cholesterol			2	2		
				Question 6 total	**2**	**0**	**6**	**8**	**2**	**6**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7				**Indicative content** Description • magnesium atom loses its 2 outer shell electrons • becomes a positive ion • both chlorine atoms gain an electron • become negative ions • attraction between the oppositely charged ions  Explanation • they transfer electrons to gain full outer shell electrons • high melting point due to strong bonds between the ions requiring lots of energy to split them • it conducts electricity when molten or in solution because only then are the charged ions are free to move and carry the electrical charge / it does not conduct when solid as ions are immobile	4	2		6		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				5-6 marks Comprehensive description of bonding and explanation of two properties *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** Good basic description of bonding and explanation of one property *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 simple description of bonding or explanation of one property *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 7 total	**4**	**2**	**0**	**6**	**0**	**0**

FOUNDATION TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	2	1	2	5	2	3
2	2	4	2	8	1	3
3	1	4	0	5	0	0
4	8	5	0	13	3	0
5	2	1	5	8	2	0
6	6	0	0	6	0	6
7	3	7	1	11	6	6
8	0	4	0	4	3	0
TOTAL	24	26	10	60	17	18

HIGHER TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	3	7	1	11	6	6
2	0	4	0	4	3	0
3	7	3	1	11	3	0
4	6	4	2	12	1	6
5	2	5	1	8	5	3
6	2	0	6	8	2	6
7	4	2	0	6	0	0
TOTAL	24	25	11	60	20	21