GCSE MARKING SCHEME

SUMMER 2022

GCSE
SCIENCE (DOUBLE AWARD) - UNIT 5
3430U50-1 AND 3430UE0-1

INTRODUCTION

This marking scheme was used by WJEC for the 2022 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.

WJEC GCSE SCIENCE (DOUBLE AWARD) UNIT 5 – CHEMISTRY 2

SUMMER 2022 MARK SCHEME

GENERAL INSTRUCTIONS

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

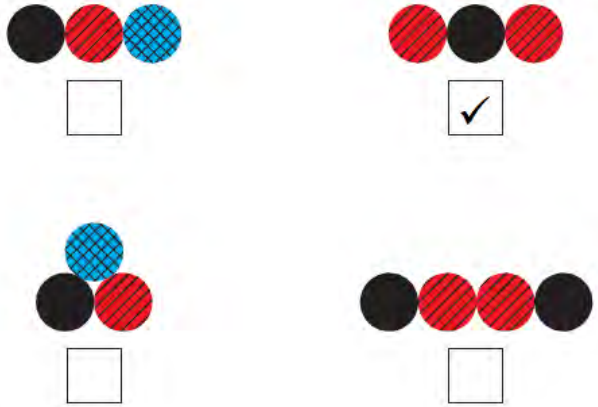
A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide 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.

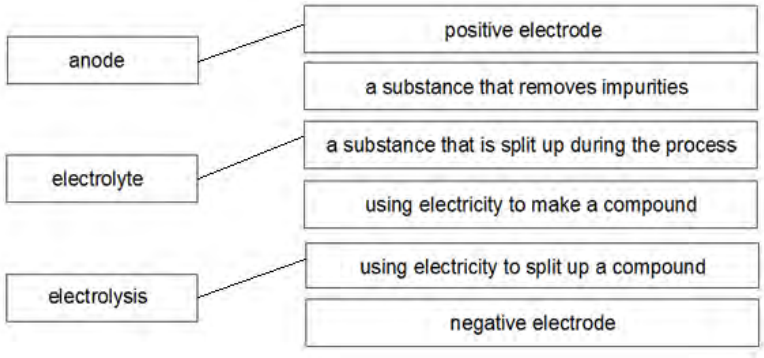
Marking abbreviations

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

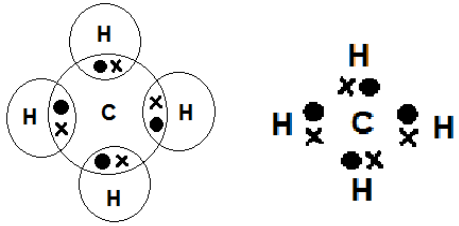
cao	=	correct answer only
ecf	=	error carried forward
bod	=	benefit of doubt

Foundation Tier only questions

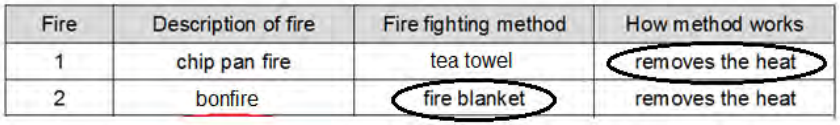
Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)	(i)		**A** (1) **B** (1) **D** (1)	3			3		
		(ii)		1		1		1		
		(iii)		$CaCO_3$		1		1		
		(iv)					1	1		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)	(i)		award (1) for each correct line  	3			3		
		(ii)		melting point (1) import (1) liquid (1)	3			3		
		(iii)		$2\ Al_2O_3 \longrightarrow \boxed{4}\ Al + 3O_2$		1		1	1	
				Question 1 total	**9**	**3**	**1**	**13**	**1**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)		measuring cylinder (1) thermometer (1)	2			2		2
		(ii)		award (1) for either of following repeat the method compare results with another group	1			1		1
		(iii)		exothermic		1		1		1
	(b)	(i)		436 + 243 accept either of following add H—H and Cl—Cl add the first two numbers		1		1		
		(ii)		864 (2) if incorrect award (1) for 2 × 432 / 2 × H—Cl		2		2		
		(iii)		**c** (1) **d** (1)	2			2		
				Question 2 total	**5**	**4**	**0**	**9**	**0**	**4**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		oxygen / O_2 accept O	1			1		
		(ii)		water / H_2O (1) carbon dioxide / CO_2 (1) do not accept carbon monoxide	2			2		2
		(iii)		alkenes ☐ monomers ☐ polymers ☐ alkanes ✓	1			1		
	(b)	(i)		award (2) for correct diagram  accept any representation of electrons e.g. all crosses or all dots if incorrect award (1) for any representation of 4 hydrogen atoms bonded to central carbon atom		2		2		

<table>
<tr><th colspan="4" rowspan="2">Question</th><th rowspan="2">Marking details</th><th colspan="6">Marks available</th></tr>
<tr><th>AO1</th><th>AO2</th><th>AO3</th><th>Total</th><th>Maths</th><th>Prac</th></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td>covalent</td><td>1</td><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td>(c)</td><td></td><td></td><td>award (1) for each error and correction

 
<table>
<tr><th>Fire</th><th>Description of fire</th><th>Fire fighting method</th><th>How method works</th></tr>
<tr><td>1</td><td>chip pan fire</td><td>tea towel</td><td>removes the heat</td></tr>
<tr><td>2</td><td>bonfire</td><td>fire blanket</td><td>removes the heat</td></tr>
</table>

fire 1 - tea towel removes the oxygen (not heat)
fire 2 - use a hose pipe / water (not fire blanket)

accept error implied in the correction for both

award (1) where both errors are identified but no corrections given

incorrect ‘error’ cannot gain credit for correction</td><td></td><td></td><td>2</td><td>2</td><td></td><td>2</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Question 3 total</td><td>5</td><td>2</td><td>2</td><td>9</td><td>0</td><td>4</td></tr>
</table>

<table>
<tr><th colspan="4" rowspan="2">Question</th><th rowspan="2">Marking details</th><th colspan="6">Marks available</th></tr>
<tr><th>AO1</th><th>AO2</th><th>AO3</th><th>Total</th><th>Maths</th><th>Prac</th></tr>
<tr><td>4</td><td>(a)</td><td>(i)</td><td></td><td>
<table>
<tr><th>Statement</th><th>True</th><th>False</th></tr>
<tr><td>The number of plastic bags used in Wales and England has reduced since charging for them</td><td>✓</td><td></td></tr>
<tr><td>Retailers donate all the money generated from the sale of plastic bags to good causes</td><td></td><td>✓</td></tr>
<tr><td>Plastic bags are no longer used</td><td></td><td>✓</td></tr>
<tr><td>The charge for plastic bags has totally stopped their use in Wales</td><td></td><td>✓</td></tr>
<tr><td>The use of plastic bags leads to environmental problems</td><td>✓</td><td></td></tr>
<tr><td>The charge for plastic bags is beneficial to good causes</td><td>✓</td><td></td></tr>
</table>
award (3) for all 6 correct
award (2) for any 4 or 5 correct
award (1) for any 2 or 3 correct</td><td></td><td></td><td>3</td><td>3</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td>575 (2)

if incorrect award (1) for any of following
115
140 – 25
reference to both 700 and 125</td><td></td><td>2</td><td></td><td>2</td><td>2</td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td></td><td>81% (2)

if incorrect award (1) for either of following
100 – 19
6 + 14 + 38 + 23</td><td></td><td></td><td>2</td><td>2</td><td>2</td><td></td></tr>
<tr><td></td><td>(c)</td><td></td><td></td><td>non-biodegradable / doesn’t break down / doesn’t rot

accept takes a long time to decompose</td><td>1</td><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td>Question 4 total</td><td>1</td><td>2</td><td>5</td><td>8</td><td>4</td><td>0</td></tr>
</table>

<table>
<tr><th colspan="4">Question</th><th rowspan="2">Marking details</th><th colspan="6">Marks available</th></tr>
<tr><th>AO1</th><th>AO2</th><th>AO3</th><th>Total</th><th>Maths</th><th>Prac</th></tr>
<tr><td>5</td><td></td><td></td><td></td><td>Indicative content

AO1
• More reactive metal can displace a less reactive metal
• Explanation of order of reactivity in terms of displacement
  • Mg displaces all of the metals
  • Cu does not displace any of the metals
  • Fe displaces Cu
  • Metals cannot displace themselves

AO2
• Order of reactivity Mg > Fe > Cu
• Word / symbol equations for the reactions taking place

5-6 marks
Correct order of reactivity with clear reasoning in terms of reactions taking place; correct word/symbol 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
Correct order of reactivity with attempt at explanation with reference to some reactions; reference to product(s) of reactions
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
Correct description of results; some knowledge of displacement of less reactive metals
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.

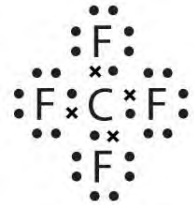
0 marks
No attempt made or answer worthy or any credit.</td><td>3</td><td>3</td><td></td><td>6</td><td></td><td>6</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Question 5 total</td><td>3</td><td>3</td><td>0</td><td>6</td><td>0</td><td>6</td></tr>
</table>

Common questions

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6/1	(a)	(i)		award (1) for either of following 11429 11466		1		1	1	1
		(ii)		award (1) for either of following able to absorb <u>many times</u> their own mass (of water) able to absorb <u>hundreds of times</u> their own mass (of water) accept weight as alternative to mass neutral answersable to absorb 11429 times their own mass (of water) able to absorb more than their own mass (of water) able to absorb lots of water			1	1		
	(b)	(i)		award (2) for all points plotted correctly – tolerance ±½ square award (1) for 4 or 5 points plotted correctly award (1) for appropriate curve do not accept point to point line		3		3	3	3
		(ii)		award (1) for any of following bead absorbs water at 40°C more quickly / at higher rate bead absorbs more water at 40°C bead absorbs water at 10°C more slowly / at lower rate bead absorbs less water at 10°C award (1) for any of following bead becomes saturated (after 10 hours) in water at 40°C bead stops absorbing water at 40°C (after 10 hours) bead not yet saturated (after 10/12 hours) in water at 10°C bead still absorbing water at 10°C (after 10/12 hours)			2	2		2
				Question 6/1 total	**0**	**4**	**3**	**7**	**4**	**6**

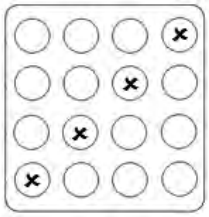
Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7/2	(a)	(i)		**A** magnesium / Mg (1) **B** carbon dioxide / CO_2 (1)		2		2		
		(ii)		**C** $CuCl_2$ (1) **D** H_2O (1) neutral answers – names of compounds **C** and **D**		2		2		
	(b)			**2**HCl + **Na_2CO_3** → 2NaCl + H_2O + CO_2 award (1) for correct formula award (1) for balancing mark independently – balancing mark can be awarded even if the formula is incorrect		2		2		
	(c)	(i)		white precipitate / solid (forms)	1			1		1
		(ii)		$Ag^+(aq) + Cl^-(aq) \longrightarrow AgCl(aq)$ ☐ $Ag^-(aq) + Cl^+(aq) \longrightarrow AgCl(aq)$ ☐ $Ag^+(aq) + Cl^-(aq) \longrightarrow AgCl(s)$ ✓ $Ag^+(s) + Cl^-(s) \longrightarrow AgCl(s)$ ☐ $Ag^-(aq) + Cl^+(aq) \longrightarrow AgCl(s)$ ☐			1	1		
				Question 7/2 total	**1**	**6**	**1**	**8**	**0**	**1**

Higher Tier only questions

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		ionic	1			1		
		(ii)		award (1) for either of following melted / made molten dissolved - accept put into water neutral answer - heated ions are free to move (1) do not accept reference to electrons being free to move	2			2		
	(b)	(i)		award (2) for correct diagram  accept any representation of electrons e.g. all crosses or all dots if incorrect award (1) for all four shared pairs		2		2		

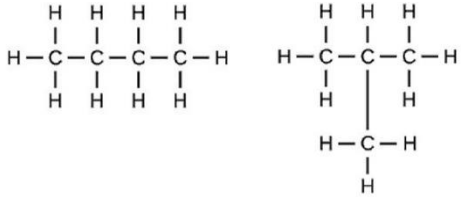
Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		(individual) molecules are not joined / weak forces of attraction between molecules (1) little energy/heat needed to break (intermolecular) forces (of attraction) (1)	2			2		
	(c)			absorbs UV rays / reflects UV rays / transparent (1) neutral answer – absorbs sunlight catalyses the breakdown of dirt / enables water to spread out (into a film) on the window / hydrophilic (1)	2			2		
				Question 3 total	**7**	**2**	**0**	**9**	**0**	**0**

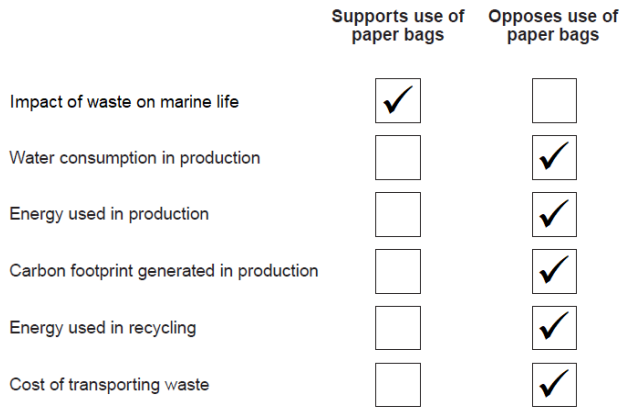
Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		award (1) for either of following aluminium is more reactive than iron aluminium displaces iron award (1) for correct reference to reduction e.g. aluminium reduces iron(III) oxide aluminium takes the oxygen away from the iron iron(III) oxide is reduced	2			2		
		(ii)		Fe_2O_3 + 2Al → **2Fe + Al_2O_3** products (1) balancing (1) balancing mark can only be awarded if the correct products given		2		2		
		(iii)		70% (2) if incorrect award (1) for any of following $M_r(Fe_2O_3)$ = 160 56 + 56 + 16 + 16 + 16 total relative mass of iron = 112 56 + 56		2		2	2	

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)	(i)		 all four crosses shown (1) award (1) for any of following metals do not displace themselves from solution metals do not react with their own nitrate metals do not react with themselves metals have the same reactivity – neutral answer correct explanation may be credited when the first mark is not awarded	2			2		2
		(ii)		0.381g / 0.38g / 0.4g (3) if answer incorrect credit working 112 ↔ 190.5 / (2 × 56) ↔ (3 × 63.5) / $\frac{0.224}{112}$ (1) $\frac{0.224}{112}$ × 190.5 (1) alternative method 0.004 mol Fe (1) 0.006 mol Cu (1) ecf possible		3		3	3	

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)	(i)		$\boxed{2}\ Cl^- \longrightarrow Cl_2 + \boxed{2}\ e^-$ (1) award (1) for either of following chloride / Cl^- ions lose electrons oxidation is loss of electrons do not accept - chlorine / zinc chloride loses electrons	2			2		
		(ii)	I	award (1) for any of following some of the zinc chloride/electrolyte is also on the electrode impurities also stick to the electrode product of side reactions stick to the electrode			1	1		1
			II	the chlorine formed is a gas / does not stick to the electrode	1			1		1
				Question 4 total	**7**	**7**	**1**	**15**	**5**	**4**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		award (1) for each of following • up to C_{16} / before C_{17} – demand is greater than the supply (OWTTE) • after C_{16} / from C_{17} onwards – supply is greater than demand (OWTTE) accept appropriate alternatives to the number of carbon atoms e.g. chain length of 16 if no other credit award (1) for any of following (as the size increases) the demand decreases but the supply increases shorter chains have greater demand than supply and longer chains have greater supply than demand short chains have high demand and long chains have low demand short chains have low supply and long chains have high supply			2	2		
		(ii)	I	breaking of a large hydrocarbon into smaller hydrocarbons (1) award (1) for either of following heat **and** pressure heat **and** catalyst	2			2		
			II	$C_{14}H_{30}$		1		1	1	

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)	(i)		(compounds with the) <u>same</u> molecular <u>formula</u> but <u>different structures</u> / <u>different structural formulae / different arrangement of atoms</u>	1			1		
		(ii)		award (1) for each correct isomer 	2			2		
				Question 5 total	**5**	**1**	**2**	**8**	**1**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)			paper bags produce a greater mass of waste than plastic bags / plastic bags produce a lower mass of waste than paper bags (1) plastic bags cause more litter than paper bags / paper bags cause less litter than plastic bags (1) there must be comparison between the two types of bag in both cases so the following are neutral answers plastic bags cause litter problems paper bags produce a large mass of rubbish			2	2		
	(b)			 award (3) for all correct award (2) for any 4 or 5 correct award (1) for any 2 or 3 correct			3	3		
	(c)			paper bag **because** atmospheric acidification leads to acid rain / paper bag production produces acid rain		1		1		
				Question 6 total	**0**	**1**	**5**	**6**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)			**Indicative content** **AO1** • Temperature increases as acid is added up to 25 cm^3 • pH decreases from pH 14-8 • As more alkali is neutralised • Maximum temperature at point when **all** alkali is just neutralised / pH is 7 • Additional acid results in no further reaction but temperature decreases (due to addition of cooler solution / returning to room temperature) • pH decreases from pH 6-1 / below 7 **AO2** • Alkali is neutralised as first 25 cm^3 of acid is added • 25 cm^3 is point of complete neutralisation • 25-50 cm^3 acid is in excess	3	3		6		6
				5-6 marks Good understanding of the link between temperature and neutralisation; volumes from the graph used to support the explanation *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** Full description of the temperature change; some understanding of the link between temperature and neutralisation *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 temperature change shown on the graph *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				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)			$H^+ + OH^- \rightarrow H_2O$ ignore any state symbols and attempt to balance	1			1		
				Question 7 total	**4**	**3**	**0**	**7**	**0**	**6**

FOUNDATION TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	9	3	1	13	1	0
2	5	4	0	9	0	4
3	5	2	2	9	0	4
4	1	2	5	8	4	0
5	3	3	0	6	0	6
6	0	4	3	7	4	6
7	1	6	1	8	0	1
TOTAL	24	24	12	60	9	21

HIGHER TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	0	4	3	7	4	6
2	1	6	1	8	0	1
3	7	2	0	9	0	0
4	7	7	1	15	5	4
5	5	1	2	8	1	0
6	0	1	5	6	0	0
7	4	3	0	7	0	6
TOTAL	24	24	12	60	10	17