



GCSE MARKING SCHEME

SUMMER 2024

**GCSE
APPLIED SCIENCE (SINGLE AWARD) - UNIT 1
3440U10-1 & 3440UA0-1**

About this marking scheme

The purpose of this marking scheme is to provide teachers, learners, and other interested parties, with an understanding of the assessment criteria used to assess this specific assessment.

This marking scheme reflects the criteria by which this assessment was marked in a live series and was finalised following detailed discussion at an examiners' conference. A team of qualified examiners were trained specifically in the application of this marking scheme. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners. It may not be possible, or appropriate, to capture every variation that a candidate may present in their responses within this marking scheme. However, during the training conference, examiners were guided in using their professional judgement to credit alternative valid responses as instructed by the document, and through reviewing exemplar responses.

Without the benefit of participation in the examiners' conference, teachers, learners and other users, may have different views on certain matters of detail or interpretation. Therefore, it is strongly recommended that this marking scheme is used alongside other guidance, such as published exemplar materials or Guidance for Teaching. This marking scheme is final and will not be changed, unless in the event that a clear error is identified, as it reflects the criteria used to assess candidate responses during the live series.

WJEC GCSE APPLIED SCIENCE (SINGLE AWARD)

UNIT 1: SCIENCE IN THE MODERN WORLD

SUMMER 2024 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

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
1.	(a)	(i)		Earth			1	1		
		(ii)		Neptune		1		1		
		(iii)		Uranus	1			1		
		(iv)		Mars			1	1		
	(b)			Distance 3.6 Temp of -93		2		2		
				Question 1 total	1	3	2	6		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2.	(a)	(i)		5500 units		1		1	1	
		(ii)		Savings = 4×5500 (ecf) (1) 22 000 (ecf) p	1	1		2	2	
		(iii)		£ 220 (ecf)		1		1	1	
		(iv)		2000 / 220 (ecf) (1) = 9 / 9.1 / 9.09 / 9.091 (ecf) (1) Accept 9 years 36.5 days Award 1 mark only for 9.0 / 9.090	1	1		2	2	
		(v)	I II	decreases decreases		2		2		
	(b)	(i)		Ticks in boxes 1, 3, 5 4 ticks – 2 marks max 5 ticks – 1 mark max	3			3		
		(ii)		2 (1)		1		1		
				Question 2 total	5	7		12	6	

Question				Marking details				Marks Available					
								AO1	AO2	AO3	Total	Maths	Prac
3.				Seed banks	Bioaccumulation	Eutrophication	Nature reserve	6			6		
				✓									
						✓							
					✓								
						✓							
							✓						
					✓								
						✓							
				6 × (1) More than one tick per line – 0 marks									
				Question 3 total				6			6		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4.	(a)			2,8,7		1		1		
	(b)			Gains (1) 2,8,8 (1) Negative (1)	1 1	1		3		
	(c)			NaCl	1			1		
	(d)			Francium		1		1		
				Question 4 total	3	3		6		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5.				Indicative content: 1. Connect the solar panel to the voltmeter. 2. Place the lamp at the first distance (e.g. 20cm) from the solar panel. 3. Measure distance with a ruler 4. <u>Measure</u> the (output) voltage. 5. Repeat (steps 2 to 4) 6. Change the distance 7. Repeat the experiment twice more. 8. Calculate the mean voltage for each distance. 9. Compare the voltages at different distances 5-6 marks at least 5 points <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 at least 3 points <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 1 or 2 points <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 marks <i>No attempt made or no response worthy of credit.</i>	6			6		6
				Question 5 total	6			6		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6.	(a)			Must be {melted / molten / liquid} Dissolved neutral	1			1		
	(b)			Aluminium + oxygen (both needed either order)	1			1		
	(c)			3 (1) 3 (ecf) $\times$ 16 = 48 (1) 102 (ecf) (1)		3		3	3	
				Question 6 total	2	3		5	3	

Question				Marking details			Marks Available					
							AO1	AO2	AO3	Total	Maths	Prac
7.	(a)	(i)		Order:	Rodentia (1)	Rodentia		3		3		
				Family:	Sciuridae	Sciuridae (1)						
				Genus:	<i>Sciurus</i>	<i>Sciurus</i>						
				Species:	<i>vulgaris</i>	<i>carolinensis</i> (1)						
		(ii)		Avoid confusion / duplication caused by local or common names / universal name / same in every language / same in every country / same all over the world / same for everyone			1			1		
	(b)	(i)		Number of (red) squirrels has decreased (1) (red) squirrels not found in as many places / only in Scotland (and Northern England) / only in the North (1)				2		2		
		(ii)		Any 2 × (1) from: They have larger bodies (1) Weigh more (1) Longer tail (1) Less predation (1) Spread of disease / resistance to disease (1) Better camouflaged (1) More aggressive (1)			2			2		
	(c)	(i)		Number of red squirrels per ha = 0.48 × 0.26 × 244 (1) = 30.45 / 30 / 31 (1)			1	1		2	2	
		(ii)		Number of grey squirrels per ha = 1.2 × 0.74 × 244 = 216.67 / 216.7 / 216 / 217				1		1	1	

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
		(iii)		Difference $216(.7) - 30(.45) = 186$ (ecf)		1		1	1	
		(iv)		First year's total (2) Second year's total (1) so disagree OR almost the same so agree. Conclusion depends on years chosen. Conclusion needed for third mark Year 1 total = $30 + 68 = 98$ Year 2 total = $50 + 6 = 56$ Year 3 total = $82 + 2 = 84$ Year 4 total = $86 + 2 = 88$ Year 5 total = $94 + 0 = 94$ No data no mark			3	3	3	
				Question 7 total	4	8	3	15	7	

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
8/1	(a)	(i)		{Measure / record} current	1			1		1
		(ii)		{Measure / record} voltage	1			1		1
	(b)	(i)		Result at 40 (°C) / 0.6 (mA) / 10 (kΩ) (is an anomaly) (1) {does not follow trend / (0.6) decreases rather than increases / (10) shows an increase then a decrease } so disagree (1) Correct judgement needed for two marks			2	2		2
		(ii)		Resistance scale – expect 1kΩ/cm (1) 5 points plotted $\pm < 1$ small square (2) 4 plotted $\pm < 1$ small square (1) Best fit curve between 10 and 50°C (1) Ignore plot at 40°C		4		4	4	4
		(iii)		As T increases from {10°C to 20°C / 20°C to 40°C} (1) (From 10°C to 20°C) resistance drops from 15 kΩ to 7.5 kΩ (which is half) (1) But from 20°C to 40°C resistance changes from 7.5 kΩ to 10 kΩ (which is not half so disagree) (1) Accept: value between 1.5 and 2.5 kΩ instead of 10 kΩ taken from graph (1)			3	3	2	3
		(iv)		Extrapolation passed 50°C (1) Accept any line correct reading from candidate line at 60°C (1) No extrapolation shown – no marks		2		2	2	2

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
		(v)		Change in resistance = $15 - 0.94$ (1) = $14.06 \text{ k}\Omega$ so suitable (1) Correct judgement needed for 2 marks Accept for 2 marks: $14 \text{ k}\Omega$ so suitable			2	2	2	2
	(c)			Add a variable resistor / variable power supply / variable voltage (1) Keep T constant / using water bath (1) Vary {resistance (of the variable resistor) / voltage (of power supply)} <u>and</u> record readings (of the new) voltage and current (1) Reverse {thermistor / power supply} (and repeat) (1)	1		3	4		4
				Question 8/1 total	3	6	10	19	10	19

Question				Marking details		Marks Available					
						AO1	AO2	AO3	Total	Maths	Prac
2.	(a)	(i)		Family:	Sciuridae	1			1		
				Genus:	<i>Sciurus</i>						
				Species:	<i>carolinensis</i>						
		(ii)		Avoid confusion / duplication caused by local or common names / universal name / same in every language / same in every country / same all over the world / same for everyone		1			1		
	(b)			Any 3 × (1) from: (More successful at competing) for food / water (1) (More successful at) nesting / habitats / shelter (1) Less predation (1) Spread of disease (1) Better camouflaged (1) More aggressive (1)		3			3		
	(c)	(i)		Number of red squirrels per ha = $0.48 \times 0.26 = 0.1248$ (1) Number of grey squirrels per ha = $1.2 \times 0.74 = 0.888$ (1) Difference / ha = 0.888 (ecf) – 0.1248 (ecf) = 0.7632 (1) Difference in forest = 0.7632 (ecf) × 244 = 186(.2) (1)			4		4	4	
		(ii)		(Rapid) decrease of grey squirrels <u>to zero</u> / goes from 68 to 0 (1) (Rapid) increase of red squirrels in early years but increase has declined / Red squirrels have increased from 30 to 94 (in 5 years) tick (1) Accept grey have decreased and red have increased (1)				2	2		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
		(iii)		Captive breeding of red squirrels / cull the grey squirrels / introduce predator to grey squirrel	1			1		
				Question 2 total	6	4	2	12	4	

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3.	(a)			Cost of gas = $0.04 \times 27\,900 = 1116$ (1) Cost of electricity = $1708.50 - 1116$ (ecf) = 592.50 (1) Unit cost of electricity = $59\,250$ (ecf) / 3950 (1) = 15 p (ecf) (1)		4		4	4	
	(b)	(i)		5500		1		1	1	
		(ii)		5500 (ecf) $\times 0.04$ (1) = 220 $2000 / 220$ (ecf) (1) = $9(.1)$ years (1)	1	2		3	3	
		(iii)		Price / unit of gas could increase or sunshine hours could increase / less hot water used / less heating / less cooking			1	1		
	(c)	(i)		$2\text{Cu} + \text{O}_2$ (1) $\rightarrow 2\text{CuO}$ (1) for balancing $\text{CuO} + \text{CO}_2$ (1) $\rightarrow \text{CuCO}_3$	1 1	1		3		
		(ii)		Element contains 1 type of atom but compounds contain 2 or more / compounds contain more than one element	1			1		
				Question 3 total	4	8	1	13	8	

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4.	(a)			Sodium: 2,8,1 Oxygen: 2,6		2		2		
	(b)			Na ₂ O		1		1		
	(c)			2 sodium atoms lose 1 electron / sodium atoms lose 1 electron / each sodium atom loses 1 electron (1) Oxygen atom gains 2 electrons (1) Sodium forms 1+ ion (1) Oxygen forms 2- ion (1) Correctly labelled diagrams can be credited Sodium loses an electron and oxygen gains an electron (1) Sodium becomes a + ion and oxygen becomes a – ion (1)		4		4		
	(d)	(i)		Lithium / Li	1			1		
		(ii)		Outer {electron / shell} closer to nucleus (1) Greater attraction to nucleus / harder to lose (1) Do not accept it is higher up in group one	2			2		
				Question 4 total	3	7		10		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5.	(a)			Indicative content: a. Bacteria / fungi / microbes b. decomposers c. decaying / putrefy / decomposition d. {protein / manure / waste} changed to {ammonia / ammonium compounds} e. Ammonia changed to nitrates f. By nitrifying bacteria g. Nitrates absorbed into plants (thorough roots) 5-6 marks At least 5 statements <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 3-4 statements <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 1-2 statements <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 marks <i>No attempt made or no response worthy of credit.</i>	6			6		6
				Question 5 total	6			6		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6.	(a)			1 year on Venus = $0.6 \times 365 = 219$ (1) which is less than <u>243</u> (so true) (1)			2	2	1	
	(b)			Venus' atmosphere contains carbon dioxide (1) which is a greenhouse gas (1) OR Mercury has no {atmosphere / carbon dioxide} (1) So no greenhouse effect (1)	2			2		
	(c)			Neptune is 20 times as far from the Sun than Mars (1) The year is 82.5 times bigger (1) OR Neptune is 20 times as far from the Sun than Mars (1) The year should be 40 (1) OR Neptune is 20 times as far from the Sun than Mars (1) The year is more than 20 times bigger (1)		2		2	2	
				Question 6 total	2	2	2	6	3	

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
7.	(a)			{Breaking down / splitting} a compound (1) using an electric current / electricity (1)	2			2		
	(b)			So <u>ions</u> can move	1			1		
	(c)			Gains electrons	1			1		
	(d)			At the negative electrode / cathode (1) metal <u>ions</u> are positive (1)	2			2		
	(e)			A_r of Al = 27 & A_r of O = 16 (1) $(2 \times 27) + (3 \times 16)$ (ecf from atomic numbers) (1) = 102 (ecf) (1) Allow $(2 \times 13) + (3 \times 8) = 50$ for 2 marks (or combination of mass and atomic numbers)		3		3	3	
				Question 7 total	6	3		9	3	

FOUNDATION TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	1	3	2	6		
2	5	7		12	6	
3	6			6		
4	3	3		6		
5	2	3		5	3	
6	6			6		6
7	4	8	3	15	7	
8	3	6	10	19	10	19
TOTAL	30	30	15	75	26	25

HIGHER TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	3	6	10	19	10	19
2	6	4	2	12	4	
3	4	8	1	13	8	
4	3	7		10		
5	6			6		
6	2	2	2	6	3	
7	6	3		9	3	
TOTAL	30	30	15	75	28	19