



GCSE MARKING SCHEME

SUMMER 2024

**GCSE
APPLIED SCIENCE (DOUBLE AWARD) - UNIT 2
3445U20-1 & 3445UB0-1**

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 (DOUBLE AWARD) – UNIT 2

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)			Animals (1) Plants (1) Fungi (1)	3			3		
	(b)			D - G - A 1/2 correct (1) All correct (2)	2			2		
	(c)			Chordata (1) Mammalia (1) Canis (1)	1 1	1		3		
				Question 1 total	7	1		8		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)			Combustion (1) Respiration (1) Decay (1)	3			3		
	(b)	(i)		Nitrates	1			1		
		(ii)		Nitrates	1			1		
				Question 2 total	5			5		

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
3	(a)		Collect samples (1) Not: water samples Record the number of each invertebrate that has been caught / record data / count them / identify them (1)	2			2		2
	(b)	(i)	All bars correct $\pm < 1$ small square (2) 5 bars correct $\pm < 1$ small square (1) 4 bars correct (0) Ignore width of bar		2		2		2
		(ii)	3			1	1		1
		(iii)	Presence of stonefly nymphs		1		1		1
			Question 3 total	2	3	1	6		6

Question		Marking details		Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
4	(a)		Steady state (1) & Big bang (1) ticked 3 boxes ticked (-1) 4 boxes ticked (0)	2			2		
	(b)		Radio – micro(waves) – IR – visible / light – UV – X-rays – gamma (rays) Accept gamma symbol Any 2 × (1)	2			2		
	(c)		helium ticked 2 ticks = 0 marks			1	1		
	(d)	(i)	Mars		1		1		
		(ii)	2 Accept: Earth and Mars		1		1		
		(iii)	Jupiter		1		1		
		(iv)	(No) because it is further away than Neptune. OR (No) otherwise its orbit would be between 228 and 779. OR (No) if orbit between Mars and Jupiter it would be less than 10 180 OR Mars and Jupiter are only 228 and 779 from the Sun, so Eris can't be found between then			1	1		
	(e)		Middle orbit ticked	1			1		
			Question 4 total	5	3	2	10		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			15 × 4.2 × 5 (1) = 315 J (1)	1	1		2	1	2
	(b)			1323 (1) 4410 J (1) 5733 (ecf from table values) (1)		3		3	3	3
				Question 5 total	1	4		5	4	5

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6				<p>Blind study</p> <p>Double blind study</p> <p>Placebo</p> <p>One mark per correct line</p> <p>an inactive substance made to look like the real drug</p> <p>when the patient and the researcher do not know if they are using the real drug</p> <p>when the researcher does not know if they are using the real drug</p> <p>when the patient does not know if they are given the real drug</p>	3			3		
Question 6 total					3			3		

Question				Marking details						Marks Available					
										AO1	AO2	AO3	Total	Maths	Prac
7					light	em	sound	magnetic	drugs	4					
				Chemotherapy					✓						
				Ultrasound			✓								
				MRI scan				✓							
				CAT scan		✓									
			Question 7 total						4						

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
8	(a)		Antigens (1) Antibodies (1) Memory cells (1)	3			3		
	(b)		<p>Indicative content: After first vaccination: There is a delay of about half a week before antibody levels rise. Antibody levels reach a peak of 10 units after about 2.5 weeks. Antibody levels drop to zero after about 4.5 weeks. After booster: Antibody levels rise faster after booster given. They rise to a higher peak of 10 000 units after 6.5 weeks. They drop to 100 after 10 weeks.</p> <p>5 – 6 marks Detailed description including data about levels and time. <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></p> <p>3 – 4 mark Description including some data about levels/time. <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></p> <p>1-2 marks Limited detail and limited / no data. <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></p> <p>0 marks <i>No attempt made or no response worthy of credit.</i></p>		6		6		
			Question 8 total	3	6		9		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
9	(a)			55		1		1		1
	(b)			12		1		1	1	1
	(c)			12 / same answer as (b)		1		1		1
	(d)	(i)		15		1		1	1	1
		(ii)		$85 - 15$ (ecf) = 70			1	1	1	1
	(e)			7/8/9			1	1	1	1
				Question 9 total		4	2	6	4	6

Question			Marking details	Marks Available						
				AO1	AO2	AO3	Total	Maths	Prac	
10/1	(a)		<p>Dave: Long distance cf middle distance: {4 is not double 2.5 / 120 is not double 80 / 30 is not double 20 / double 2.5 = 5 / double 80 = 160 / double 20 = 40} (1)</p> <p>Tom: Olympic cf sprint: {1.5 km is double 750 m / 40 is double 20 / 10 is double 5} (1)</p> <p>(So Dave is wrong / Tom is correct)</p>			2	2	2		
	(b)		<p>Airflow/minute at 4 minutes = $13.1 \times 2.9 = 37.99/38$ (1) Airflow/minute at 3 minutes = $13.5 \times 2.7 = 36.45/36.5$ (1) (So Petula is correct)</p> <p>Allow 1 mark for 13.1×2.9 AND 13.5×2.7</p>			2	2	2		
	(c)	(i)	<p>$76/1.7^2$ (1) = 26 / 26.3 / 26.2965 (1)</p> <p>Allow 26.2 / 26.29 for 1 mark only</p>		2		2	2		
		(ii)	<p>$220 - 23 = 197$</p>		1		1	1		
	(d)		<p>114 to 152</p>			1	1			

Question		Marking details		Marks Available						
				AO1	AO2	AO3	Total	Maths	Prac	
	(e)		<p>Olympic triathlon (1)</p> <p>+ Any 2 × (1) from: swim time of (just over) 30 min / swim distance of ~1.5 km (1) cycle time of 1.3 h / cycle distance of ~40 km (1) run time of (just under/about) 1h / run distance of ~10km (1)</p> <p>Alternatives for the remaining two marks: Graph shows a total time of 2.74 h (1) and the closest triathlon time is 2.88 h (1) OR Graph shows a total distance of 51.5 km (1) the total distance in table 1 is $1.5 + 40 + 10 = 51.5$ (1) OR Graph shows total time of 2.74 (1) + transition time of 0.14 = 2.88 (1)</p>			3	3	3		
	(f)		<p>Distance = $3.8 + 180 + 42.2 = 226$ km (1) Mean speed = 226 (ecf from addition shown above) / 12.8 (1) = $17.66/17.7$ (ecf) km/h (1)</p> <p>For 2 marks: 17.6 / 17.65 on answer line</p>		3		3	3		
	(g)		<p>Change in speed = $6.2 - 1.5 = 4.7$ (1) Acc = 4.7 (ecf from subtraction shown above) / 26 (1) = $0.18 / 0.2$ (1)</p>		3		3	3		

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
	(h)		<p>From 18-24 to 35-39 the mean speed increases (1) From 35-39 upwards the mean speed decreases (for every age group) (1) So true after 39 but not before</p> <p>The peak speed is for 35-39 yr-olds (1) People below 35 and above 39 are slower (1) So only half true</p> <p>Conclusion required for 2 marks No mark for comparison of 18-24 with 70-74 without intermediate age range of 35-39</p>			2	2		
			Question 10/1 total		9	10	19	16	

Question		Marking details		Marks Available						
				AO1	AO2	AO3	Total	Maths	Prac	
2	(a)									
					3		3		3	
	(b)									
					2	1	3		3	
					5	1	6		6	

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			Any 2 x(1) from: bacteria / protists (1) animals (1) fungi (1)	2			2		
	(b)			Class (1) Family (1)	2			2		
	(c)			Avoid confusion / duplication caused by local or common names / universal name / same in every language / same in every country	1			1		
				Question 3 total	5			5		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			17		1		1	1	1
	(b)			$15 \times 4.2 \times 14$ (1) $= 882$ J (1)	1	1		2	1	2
	(c)			Any 2 \times (1) from: Energy from one oatie biscuit = $15 \times 4.2 \times 7 = 441$ (1) Energy from 20 g cheese = 5×882 (ecf) = 4410 J (1) Energy from three oatie biscuits = $441 \times 3 = 1323$ (1) Correct answer: Energy from snack = $(1323) + 4410$ (ecf) = 5733 J (1) Correct answer only 3 marks		3		3	3	3
				Question 4 total	1	5		6	5	6

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)	The participants {don't know what drugs they are taking / don't know if they are taking a drug}	1			1		
		(ii)	{Participants / patients} and {experimenters / doctors / nurses} {don't know what drugs are being used / don't know if a drug is being used}	1			1		
		(iii)	Does not contain active ingredients Accept: not the real drug / fake drug	1			1		
	(b)		Positive: <u>reduces</u> the risk of {blood clots / heart attack / stroke} (1) Not: stops Negative: can cause bleeding in the patient's stomach / stomach ulcers (1)	2			2		
	(c)		$\frac{100\,000 \times 20.7}{100} \quad (1)$ $= 20\,700 \quad (1)$		2		2	2	
			Question 5 total	5	2		7	2	

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)	(light of) certain {frequencies / wavelengths} (1) are absorbed by (cooler) gases (on the outside of stars) (1) Accept absorbed by the atmosphere of the star	2			2		
		(ii)	1 - yes (1) 2 - no 3 - no } (1) 4 - yes }			2	2		
	(b)	(i)	Distance scale (100 per 2 cm block) (1) All plots correct ($\pm < 1$ small square) (1) Non uniform scale – no marks		2		2	2	
		(ii)	Either Mercury or Venus circled		1		1		
		(iii)	Smooth curve avoiding anomaly Non uniform scale – no marks		1		1		
		(iv)	Where line crosses x-axis (± 10) Accept 190		1		1	1	
	(c)		(Highly) elliptical orbit drawn with Sun not in the middle	1			1		
			Question 6 total	3	5	2	10	3	

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
7	(a)		<p>Indicative content:</p> <ol style="list-style-type: none"> 1. Go to first location 2. Collect some water in a tray 3. Disturb the stream bed 4. Collect samples of invertebrates using the net and transfer them to the tray. 5. identify the invertebrates. 6. Record the number of each invertebrate that has been caught. 7. Pour them and the water gently back into the stream. 8. Repeat steps 1-6 at a second location. 9. Compare the invertebrates from each location. 10. Make a judgement as to the level of pollution in each location. 	6			6		6

Question				Marking details	Marks Available						
					AO1	AO2	AO3	Total	Maths	Prac	
				<p>5 – 6 marks 6+ 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></p> <p>3 – 4 mark 3-5 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></p> <p>1-2 marks up to 2 statement <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></p> <p>0 marks <i>No attempt made or no response worthy of credit</i></p>							
	(b)			<p>Location 1 – some pollution (1) Location 2 – high pollution (1)</p> <p>For one mark allow: location 1 not as polluted as location 2</p>			2	2			2
				Question 7 total	6		2	8			8

Question		Marking details		Marks Available						
				AO1	AO2	AO3	Total	Maths	Prac	
8	(a)			The greenhouse effect is caused by the (surface of the) Earth absorbing (1) and emitting {IR / EM} radiation (1) that is absorbed by (some gases in) the atmosphere (1)	3			3		
	(b)			Any 2 × (1) from: Changing weather patterns / (more) droughts / (more) flooding (1) Increased temperature / accept global warming / accept becomes hotter / climate change (1) Ice sheets melt (1) sea levels rise (1)	2			2		
	(c)			Any 2 × (1) from: Transport: e.g. switch to electric cars / ride your bike / use public transport / walk / less flying (1) Heating: e.g. Use less coal or gas in the home / solar panels on your home / heat pumps in your home / (better) insulation (1) Electricity production: e.g. Use less fossil fuel power stations / use (more) nuclear power / more wind farms / more solar power / more tidal power / more hydroelectric power (1) Energy in the home: e.g. Use low energy appliances / don't leave appliances on standby when not in use / turn lights off when not needed (1) Recycling (materials) / reusing item (1)	2			2		
				Question 8 total	7			7		

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
9	(a)		First response starts at zero / booster {doesn't / already has antibodies / memory cells present} (1) antibody levels increase faster after the booster / slower after first vaccine (1) first response peak is low(er) / peak after the booster high(er) OWTTE (1) First response – antibody levels fall below threshold / antibody levels don't drop below threshold after booster (1) Antibody levels could be referred to as immune response		4		4		
	(b)		Antigens (1) stimulate antibody production by (white blood cells / lymphocytes) (1) Memory cells produced / produce antibodies very quickly if the antigen is encountered again (1)	3					
			Question 9 total	3	4		7		

Summary Foundation Tier

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	7	1		8		
2	5			5		
3	2	3	1	6		6
4	5	3	2	10		
5	1	4		5	4	5
6	3			3		
7	4			4		
8	3	6		9		
PRQ		4	2	6	4	6
CQ		9	10	19	16	
Total	30	30	15	75	24	17

Summary Higher Tier

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1		9	10	19	16	
2		5	1	6	6	
3	5			5		
4	1	5		6	5	6
5	5	2		7	2	
6	3	5	2	10	3	
7	6		2	8		8
8	7			7		
9	3	4		7		
Total	30	30	15	75	32	14