GCSE MARKING SCHEME

SUMMER 2024

GCSE
SCIENCE (DOUBLE AWARD) – UNIT 6
HIGHER TIER
3430UF0-1

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.

GCSE SCIENCE (DOUBLE AWARD) UNIT 6 – PHYSICS 2

HIGHER TIER

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 statement.

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 do

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)			Ticks in boxes 1 and 2 i.e. Our solar system originated from a cloud of gas and dust The heavy elements in our solar system originated from a supernova -1 mark for each additional tick	2			2		
	(b)	(i)		Venus			1	1	1	
		(ii)		Venus			1	1	1	
		(iii)		Saturn is the largest [gas giant] (1) but its day is shorter than {Uranus / Neptune} (1) so agree with Rhian Judgement must be present to award 2 marks			2	2		
				Question 1 total	**2**	**0**	**4**	**6**	**2**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)			Measure count rate in absence of any radioactive isotope (1) accept measure the count rate on its own Deduct from count rates [when radioactive isotopes are present] (1)	2			2		2
	(b)	(i)		Gamma (1) only Cobalt[-60] (1)			2	2		2
		(ii)		Beta (1) and gamma (1) Silver[-110] (1)			3	3		3
	(c)	(i)		47		1		1		
		(ii)		63		1		1		
				Question 2 total	**2**	**2**	**5**	**9**	**0**	**7**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			**Indicative content:** **Description of motion** The car travels at a constant speed for 100 km in 2 hours. The car remains stationary for 1 hour. The car travels at a constant speed for 80 km in 1 hour. The car travels at a constant speed back to the start, for 180 km in 2 hours. **Comparison of speeds** Speed is 50 km/h in first 2 hours. Speed is 0 km/h for next hour. Faster speed of 80 km/h in next hour **or** between 3 and 4 hours. Fastest speed of 90 km/h in opposite direction for next 2 hours **or** between 4 and 6 hours. **5–6 marks** Detailed description of motion including data and comparison. *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** Description of motion including some data/comparison. *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.*	3	3		6	6	

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				1–2 marks A limited description of motion. *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.*						
	(b)	(i)		360 [km]		1		1	1	
		(ii)		Use of $\text{speed} = \frac{\text{distance}}{\text{time}}$ or can be implied (1) $= \frac{360\ \textbf{ecf}}{6}$ (1) data from graph substitution Mean speed = 60 [km/h] (1)	1	 1 1		 3	 2	
				Question 3 total	**4**	**6**	**0**	**10**	**9**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		Substitution into: PE = mgh i.e. 750 = 3 × 10 × h (1) Rearrangement: $h = \frac{750}{3 \times 10}$ (1) h = 25 [m] (1)	1	1 1		3	2	
		(ii)		Substitution into: KE = ½ mv^2 i.e. 600 = ½ × 3 × v^2 (1) Rearrangement: $v^2 = \frac{2 \times 600}{3}$ (1) v = 20 [m/s] (1)	1	1 1		3	2	
		(iii)		[750 – 600] = 150 [J]		1		1	1	
		(iv)		Substitution into WD = $F \times d$ i.e. 150 **ecf** = F × 25 **ecf** (1) Rearrangement: $F = \frac{150}{25}$ (1) F = 6 [N] (1)	1	1 1		3	2	
	(b)	(i)		Forces named: weight **and** {air resistance / drag} (1) NOT gravity Air resistance increases as speed increases (1) When the forces are {balanced / equal and opposite} **OR** resultant force becomes zero [terminal speed is reached] (1)	3			3		
		(ii)		Ball pulls [equally] upwards on the Earth (1) Air pushes [equally] upwards on the ball (1)		2		2		
				Question 4 total	**6**	**9**	**0**	**15**	**7**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			Mass is a measure of inertia **OR** resistance to change of {motion / state of rest}	1			1		
	(b)			**Any 2 × (1) from:** - Reduce {aerodynamic losses / air resistance} - Reduce rolling resistance **OR** correctly inflated tyres **OR** better material for the tyres - Reduce idling losses **OR** stop-start - Reduce {inertial losses / mass of vehicle} - Use the car in eco-mode - Use of regenerative braking Accept use of electric cars / hybrid cars	2			2		
	(c)			Deceleration of 40 units with crumple zone (1) compared to 100 units without (1) There is a smaller force [on the occupants of the car] (1) Award 2 marks for the deceleration is 60 units less with the crumple zone	1	1 1		3	2	
				Question 5 total	**4**	**2**	**0**	**6**	**2**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)			It's the time taken to halve (1) the activity / count rate / mass / number of {atoms / nuclei} (1)	2			2		
	(b)			Throw the cubes (1) Count the number of cubes that have landed with the shaded face upwards **OR** count the rest (1) Remove the shaded cubes **and** repeat these steps [many times] (1)	3			3		3
	(c)	(i)		Reduces the effect of randomness Accept it is more accurate Don't accept reference to reproducible / repeatable / reliable	1			1		1
		(ii)	I	Correct construction lines vertically and horizontally that meet the curve (1) Half-life = 1.7 ± 0.1 [throws] (1) Accept answers of 2 [throws] if correct construction lines are present		2		2		2
			II	Ticks in boxes 1, 3 and 6 i.e. 1F cubes show decay at the slowest rate 3F cubes show the equivalent of two half-lives after 2 throws The number of 2F cubes remaining after 4 throws is about $\frac{1}{5}$ of the original Deduct 1 mark for each additional tick			3	3		3

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)			75 hours = 5 half-lives (1) $48 \rightarrow 24 \rightarrow 12 \rightarrow$ etc (1) sequencing of halving starting from 48 Answer = 1.5 [mg] (1) **OR** $\frac{1}{2^5}$ (1) $\frac{1}{32}$ (1) Answer = 1.5 [mg] (1)		3		3	3	
				Question 6 total	**6**	**5**	**3**	**14**	**3**	**9**

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SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL	MATHS	PRAC
1	2	0	4	6	2	0
2	2	2	5	9	0	7
3	4	6	0	10	9	0
4	6	9	0	15	7	0
5	4	2	0	6	2	0
6	6	5	3	14	3	9
TOTAL	**24**	**24**	**12**	**60**	**23**	**16**