GCSE MARKING SCHEME

SUMMER 2024

GCSE
SCIENCE (DOUBLE AWARD) – UNIT 3
PHYSICS
FOUNDATION TIER
3430U30-1

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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.

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GCSE SCIENCE (Double Award) – Unit 3 – Physics 1

FOUNDATION 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.

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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

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)	(i)	I	230 [V]	1			1		
			II	2300 [W]		1		1		
		(ii)		$\frac{2300\ \mathbf{ecf}}{230\ \mathbf{ecf}}$ (1) current = 10 [A] (1)	1	1		2	2	
	(b)	(i)		3 A		1		1		
		(ii)		Tick in the 2nd box i.e. Fuses are safety features designed to prevent fires	1			1		
		(iii)		miniature circuit breaker	1			1		
				Question 1 total	**4**	**3**	**0**	**7**	**2**	**0**

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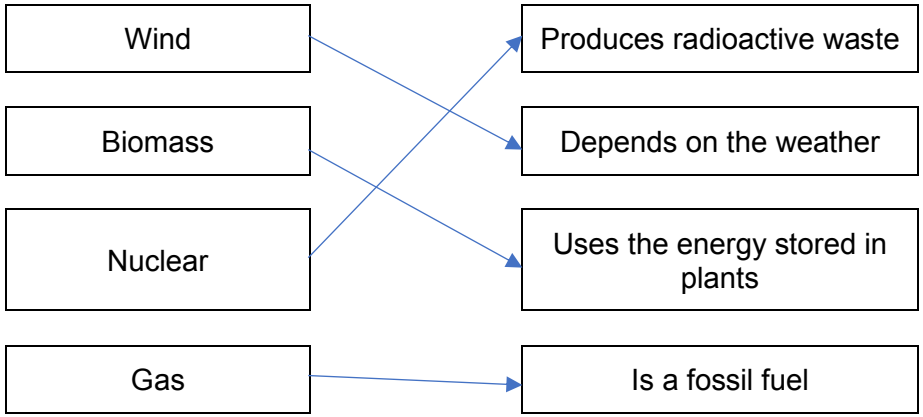
Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)		95[%]		1		1	1	
		(ii)		100 – 95 **ecf** = 5[%]		1		1	1	
	(b)			 All correct = 3 marks 2 or 3 correct = 2 marks 1 correct = 1 mark	3			3		
				Question 2 total	**3**	**2**	**0**	**5**	**2**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			A **and** V correctly added to circuit Don't accept a	1			1		1
	(b)	(i)		All 5 points plotted correctly ignore missing plot at (0,0) within <1 small square (2) 4 points correctly plotted within <1 small square (1) 3 or less points correctly plotted within <1 small square (0) Straight line of best fit through (0,0) (1)		3		3	3	3
		(ii)		0.08 [A] **ecf or** value from candidate's graph tolerance of ± 0.004		1		1	1	1
		(iii)		$\frac{4}{0.08}$ **ecf** (1) Resistance = 50 [Ω] (1)	1	1		2	2	2
		(iv)		Line is straight [through the origin] so agree **OR** as V doubles, I doubles so agree **OR** constant gradient so agree **OR** as V increases, I increases at a steady rate so agree Accept another calculated value shown to be the same. Accept the line is not straight **ecf** so I disagree Don't accept positive correlation **OR** as V increases, I increases			1	1		1
		(v)		R_{total} = 25 + 50 **(ecf)** (1) R_{total} = 75 [Ω] (1)	1	1		2	2	
				Question 3 total	**3**	**6**	**1**	**10**	**8**	**8**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			Region A = Infra-red (1) accept IR Region B = X-rays (1)	2			2		
	(b)			Ticks in boxes 3, 4 and 6 i.e. Region A have a longer wavelength than visible light EM waves are all transverse waves Microwaves are used to send mobile phone signals Deduct 1 mark for each additional tick	3			3		
	(c)			{Damages / kills} cells / damages DNA / causes mutations / causes cancer Treat as neutral reference to the word ionising.	1			1		
				Question 4 total	**6**	**0**	**0**	**6**	**0**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		4 [m]		1		1		
		(ii)		Frequency = $\frac{6}{4}$ **ecf** (1) Frequency = 1.5 (1) Hz / Hertz (1) Don't accept hz	1 1	1		3	2	
	(b)	(i)		Depth [of water]	1			1		1
		(ii)		2.61 circled for depth of 1.0 cm			1	1		1
		(iii)		Doesn't follow the {pattern / trend} **OR** Not close to other results Don't accept it is lower than the other results unless qualified			1	1		1
		(iv)		$\frac{3.24 + 3.22}{2}$ (1) Mean = 3.23 [s] (1) Apply **ecf** for incorrect answer to (b) (ii)		2		2	2	2
		(v)		As depth of water increases the wave speed increases			1	1		1
	(c)			Tick in 2nd box	1			1		
				Question 5 total	**3**	**5**	**3**	**11**	**4**	**6**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6				**Indicative content:** Insulating the house will reduce energy bills for the householder by reducing heat loss from the house. It will also reduce the amount of CO_2 produced reducing the impact on global warming. Joanne should fit cavity wall insulation and draught proofing. The total cost of these is slightly less than £1500 but they will save her the most money per year [£345]. They have the biggest reduction in CO_2 emissions [790 kg]. These also have the lowest payback times of the 4 methods so will start to save her money more quickly. **5–6 marks** Description of advantages, types and reasons (including at least 2 reasons). *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 two out of advantages, types and reasons **or** limited descriptions of all three. *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.*	2		4	6		

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				1–2 marks A limited description of any of advantages, types and reasons. *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	**2**	**0**	**4**	**6**	**0**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)	(i)		$\frac{38\,000\,000}{3\,750\,000}$ (1) Payback = 10.1 [years] (1) Accept 10 [years]		2		2	2	
		(ii)		Cost of {electricity / biomass / wood / energy} may change **OR** Energy use may change OWTTE Accept bills could change or savings could change		1		1		
	(b)			Growing trees (1) {removes / absorbs} CO_2 from the atmosphere (1) [so disagree] **Alternative:** A tree absorbs as much CO_2 (1) as it releases (1)			2	2		
	(c)	(i)		3 + 13.4 = 16.4 [MW] **or** 20.0 – 3.6 = 16.4 [MW]		1		1	1	
		(ii)		Efficiency = $\frac{16.4\ \textbf{ecf}}{20.0} \times 100$ (1) Efficiency = 82% (1) so disagree Conclusion must be present to award both marks **Alternative:** $\frac{15}{100}$ x 20 (1) Useful output = 3 M[W] (1) so disagree Conclusion must be present to award both marks			2	2	2	

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)	(i)		Substitution: energy transfer = power × time i.e. 20 × 60 (1) Conversion i.e. 20 × 3600 (1) Energy transfer = 72 000 [MJ] (1) Award 2 marks for an answer of 1200 [MJ] Award 2 marks for an answer of 7.2×10^n except for when $n \neq 4$ Award 1 mark for an answer of 1.2×10^n except for when $n \neq 3$	1	1 1		3	3	
		(ii)		$\frac{72\,000\ \textbf{ecf}}{2880} = 25$ [tonnes]		1		1	1	
		(iii)		Substitution: volume = $\frac{25\ \textbf{ecf} \times 1000}{500}$ (1) Volume = 50 [m^3] Award 1 mark for answer of 0.05 [m^3]	1	1		2	2	
		(iv)		$\frac{50\ \textbf{ecf}}{5} = 10$		1		1	1	
				Question 7 total	**2**	**9**	**4**	**15**	**12**	**0**

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SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL	MATHS	PRAC
1	4	3	0	7	2	0
2	3	2	0	5	2	0
3	3	6	1	10	8	8
4	6	0	0	6	0	0
5	4	4	3	11	4	6
6	2	0	4	6	0	0
7	2	9	4	15	12	0
TOTAL	**24**	**24**	**12**	**60**	**28**	**14**

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