GCSE MARKING SCHEME

SUMMER 2022

GCSE
PHYSICS – UNIT 1 (FOUNDATION TIER)
3420U10-1

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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.

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GCSE PHYSICS – UNIT 1

FOUNDATION TIER

SUMMER 2022 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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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1.	(a)			Ammeter Don't accept ampmeter	1			1		1
	(b)	(i)		Point at (6.0 V, 0.7 A) circled	1			1		1
		(ii)		Straight line drawn with ruler with a < 1 small square tolerance, through all points including origin, but excluding anomaly Ignore any continuation of the line past 12 V		1		1	1	1
		(iii)	I	3.0 [A] **ecf** accept 3 [A]		1		1		1
			II	Substitution: $\frac{12.0}{3.0}$ **ecf** (1) = 4 [Ω] (1)	1	1		2	2	2
		(iv)		Resistance is constant / owtte		1		1		1
	(c)			Double (1) Half (1) Half (1)		3		3		3
				Question 1 total	**3**	**7**	**0**	**10**	**3**	**10**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2.	(a)			× **(1) for each of the following:** Box 2 All em waves travel at the same speed in a vacuum. Box 3 Gamma rays can be emitted from radioactive materials. Box 4 The wavelength of em waves decrease from radio waves to gamma rays. Any extra ticks deduct one mark for each extra tick.	3			3		
	(b)	(i)	I	10 [m]	1			1		
			II	2 [waves]		1		1		
			III	3 [m]		1		1		
		(ii)	I	7.5 Hz (1) second (1)	2			2		
			II	Substitution: 3 **(ecf)** × 7.5 (1) = 22.5 [m/s] (1)	1	1		2	2	
	(c)			Award 1 mark for more waves **or** smaller wavelength Award 2 marks for twice the number of waves (4 waves) or half the wavelength (1.5 m) [so student correct] Accept for 1 mark the distance between the waves is <u>halved</u>			2	2	1	
				Question 2 total	**7**	**3**	**2**	**12**	**3**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3.	(a)			20 [g]		1		1	1	1
	(b)			140 (1) – 20 (**ecf**) = 120 [g] (1)	1	1		2	2	2
	(c)			Substitution: $\frac{120\textbf{ecf}}{100}$ (1) = 1.2 (1) Unit = g/cm^3 (1)	1 1	1		3	2	3
				Question 3 total	**3**	**3**	**0**	**6**	**5**	**6**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4.	(a)	(i)		2 000 × 0.15 = [£] 300		1		1	1	
		(ii)		Substitution: $\frac{1800}{300\ \mathbf{ecf}}$ (1) = 6 [years] (1)	1	1		2	2	
	(b)	(i)		Wind generator 2 has a payback time of 5 years (1) but wind generator 3 has a payback time of 6.5 years (1) [so salesperson is not correct.] Award 2 marks for the payback time for wind generator 3 is 1.5 years longer. **Alternative:** Wind generator 2 costs £75 more (1) But saves £150 more each year or saves £750 more over 5 years (1) [so salesperson is not correct.] **Or** Wind generator 3 costs £75 less (1) But saves £150 less each year or saves £750 less over 5 years (1) [so salesperson is not correct.] **Or** Wind generator 2 costs £75 more (1) But saves £3 000 in 5 years compared to £2250 (1) [so salesperson is not correct.] Treat as neutral any comparison with wind generator 1			2	2		
		(ii)		Cost of kWh / unit may change (1) accept price of electricity can change Wind conditions are variable (1) accept weather changes Accept for 1 mark maximum: more or less electricity may be used Don't accept cost will change **or** number of units produced will change		2		2		

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)	(i)		$B \rightarrow C \rightarrow A$ All three letters in correct order award 2 marks One or two letters correct award 1 mark		2		2		2
		(ii)	I	X		1		1	1	1
			II	Z		1		1	1	1
	(d)	(i)		Stronger magnet / move magnet closer to the coil / lighter magnet Don't accept add another magnet or smaller magnet			1	1		1
		(ii)		More <u>turns</u>. Accept more coils.			1	1		1
				Question 4 total	**1**	**8**	**4**	**13**	**5**	**6**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5.	(a)			Electrical energy is transferred from the power station to transformer A, which is a step-up transformer. It increases the voltage and reduces the current before passing it along the cables of the National Grid. Low current reduces heat loss from the cables as they heat up less. This makes the transfer of electrical energy more efficient. At transformer B the voltage is decreased [and the current increased]. Transformer B is the step-down transformer. A low voltage in the homes is safer than a high voltage. **5–6 marks** Detailed description of both efficiency and safety. *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** Detailed description of either efficiency or safety **or** limited descriptions of both. *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** A limited description of either efficiency or safety. *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.*	6			6		

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)			To get electricity / acts as a back-up source (1) When it is not sunny (or during the night) **or** when the panels don't generate enough electricity (1) **Alternative:** Electricity can be fed back [into the National Grid] (1) If it is very sunny **or** if the panels produce more electricity than is needed (1) Accept energy for electricity / sunlight is not reliable Don't accept solar panels aren't reliable		2		2		
	(c)	(i)		$20 \times 60 = 1\,200$ [A]		1		1	1	
		(ii)	I	Substitution: $230 \times 1\,200$ (**ecf**) (1) $= 276\,000$ [W] (1) **Alternative:** Substitution: 230×60 (1) $13\,800 \times 20 = 276\,000$ [W] (1)	1	1		2	2	
			II	$\frac{276\,000\ \textbf{ecf}}{1000} = 276$ [kW]		1		1	1	
				Question 5 total	**7**	**5**	**0**	**12**	**4**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6.	(a)			Wax is melting / changing from solid to liquid / changing state (1) [Energy used for] breaking bonds [between molecules] (1)	2			2		2
	(b)	(i)		Substitution: 36×220 (1) = 7 920 [J] (1)	1	1		2	2	2
		(ii)	I	$5 \times 60 = 300$ [s]		1		1	1	1
			II	Substitution: $\frac{7\,920\textbf{ecf}}{300\textbf{ecf}}$ (1) = 26.4 [W] (1) Accept 26 [W]	1	1		2	2	2
				Question 6 total	**4**	**3**	**0**	**7**	**5**	**7**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
7.	(a)			Alternating voltage [continuously] changes direction **or** switches between + and - / direct voltage never changes direction	1			1		
	(b)	(i)		Mower cuts through the cable (1) rccb (1) **Accept:** Live wire in kettle touches the neutral wire (1) Fuse / mcb (1) N.B. Safety device mark can only be awarded if the linked situation correctly identified			2	2		
		(ii)		Fast[er] acting (1) Accept more sensitive / acts at an exact value Can be reset / can be used again / can be turned on and off / doesn't need replacing / reusable (1) Don't accept renewable	2			2		
	(c)			The live wire carries <u>current</u> [to an appliance] at a <u>high voltage</u> (1) The neutral wire [completes the circuit and] carries <u>current</u> at <u>low</u> / <u>zero voltage</u> (1)	2			2		
				Question 7 total	**5**	**0**	**2**	**7**	**0**	**0**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
8.	(a)			The vibrations / oscillations (1) are parallel to the direction of wave **or** travel **or** energy transfer (1)	2			2		
	(b)			Speeds of 9 **OR** 5 [km/s] **OR** 0.5 × 8 squares (1) Difference = 4 [km/s] (1)		2		2	1	
	(c)	(i)		[Maximum] speed in the mantle is greater than the speed in the outer core / greatest speed is in the mantle / 15 [km/s] and 13 [km/s] (1) Mantle acts like a solid / outer core is liquid (1) so Bob's claim is true. Conclusion must be included to award 2 marks			2	2		
		(ii)		Mean speed = $\frac{6\,300}{550}$ (1) = 11.45 (km/s) (1) This is the actual speed at depth of 1 200 km (or at 4 900 km) (1) [So Bob's statement is not true.] **Alternative for third mark:** [At 3 500 m] the speed is 10.0 [km/s] [So Bob's statement is not true.] **Alternative:** Speed at 3500 km is 10.0 [km/s] (1) Time = $\frac{6\,300}{10}$ (1) = 630 [s] (1) [So Bob's statement is not true.] **Alternative:** Speed at 3500 km is 10.0 [km/s] (1) Distance = 10 × 550 (1) = 5 500 [km] (1) [So Bob's statement is not true.]			3	3	2	

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)	(i)		$2 \times 550 = 1\,100$ [s]		1		1	1	
		(ii)		P wave only shown i.e. one cycle (1) Size no bigger than wave at B (1) Position, the start of the wave must be within the correct 200 s range based on (d)(i) (expect 1 000 – 1 200) or apply an **ecf** (1) N.B. If drawn correctly but at station A or B apply a 1 mark penalty			3	3		
				Question 8 total	**2**	**3**	**8**	**13**	**4**	**0**

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FOUNDATION TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	Marks Available					
	AO1	AO2	AO3	Total	Maths	Prac
1	3	7	0	**10**	3	10
2	7	3	2	**12**	3	0
3	3	3	0	**6**	5	6
4	1	8	4	**13**	5	6
5	7	5	0	**12**	4	0
6	4	3	0	**7**	5	7
7	5	0	2	**7**	0	0
8	2	3	8	**13**	4	0
Total	**32**	**32**	**16**	**80**	**29**	**29**

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