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# **GCSE MARKING SCHEME**

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**SUMMER 2023**

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

## **INTRODUCTION**

This marking scheme was used by WJEC for the 2023 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.

# **GCSE SCIENCE (DOUBLE AWARD) UNIT 3 – PHYSICS 1**

## **FOUNDATION TIER**

### **SUMMER 2023 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 doubt

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)	(i)		X-rays	1			1		
		(ii)		ultraviolet accept uv	1			1		
	(b)	(i)		wavelength	1			1		
		(ii)		Ticks in boxes 1, 3 and 5. All transverse (1) All transfer energy (1) All travel through space (1)  [Note subtract 1 mark for each extra tick]	3			3		
				<b>Question 1 total</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>0</b>

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)			only the fan is on (1) both switches are closed (1)		2		2		
	(b)	(i)		Substitution: $230 \times 6$ (1) = 1380 [W] (1)	1	1		2	2	
		(ii)		13 A fuse		1		1		
		(iii)		current is too high (1) wires overheating (1)	2			2		
	(c)	(i)		Substitution: $1.5 \times 2$ (1) = 3 [kWh] (1)	1	1		2	2	
		(ii)		Substitution: $3 \text{ (ecf)} \times 30$ (1) = 90 [p] (1)	1	1		2	2	
		(iii)		Must be double the answer to the previous part, expect: $2 \times 90 \text{ (ecf)} = 180$ [p]		1		1	1	
		(iv)		1500 W		1		1	1	
				<b>Question 2 total</b>	<b>5</b>	<b>8</b>	<b>0</b>	<b>13</b>	<b>8</b>	<b>0</b>

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3		(i)		39 [g]	1			1		1
		(ii)		5 [cm <sup>3</sup> ]	1			1		1
		(iii)	I	Substitution: density = $\frac{39 \text{ ecf}}{5 \text{ ecf}}$ (1) = 7.8 (1)	1	1		2	2	2
			II	g/cm <sup>3</sup>	1			1		1
		(iv)		<u>Balance</u> with {decimal places / better resolution}			1	1		1
				<b>Question 3 total</b>	<b>4</b>	<b>1</b>	<b>1</b>	<b>6</b>	<b>2</b>	<b>6</b>

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		$300 + 50 = 350 \text{ } [\Omega]$		1		1	1	1
		(ii)		7 [V]	1			1		1
		(iii)		Substitution $I = \frac{V}{R} = \frac{7 \text{ ecf}}{350 \text{ ecf}} \text{ (1)}$ = 0.02 [A] (1)	1	1		2	2	2
		(iv)		Must match previous answer expect: 0.02 [A]	1			1		1
	(b)			temperature (1) decreases (1) increases (1)	1	1 1		3		3
	(c)	(i)		Use a {light dependent resistor / LDR}			1	1		1
		(ii)		Its <u>resistance</u> changes with [different] light [levels] <b>OR</b> it has high <u>resistance</u> in the dark <b>OR</b> it has low <u>resistance</u> in the light			1	1		1
				<b>Question 4 total</b>	<b>4</b>	<b>4</b>	<b>2</b>	<b>10</b>	<b>3</b>	<b>10</b>



Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			<p><b>Indicative content:</b></p> <p>Both cans the same distance [5 cm] from the heater  <i>If one can is closer to the heater it will be heated more than the other</i></p> <p>Same volume of water [200 cm<sup>3</sup>] in both cans  <i>If different volumes used, the temperature rise would be different</i></p> <p>Same starting temperature [8 °C] of water  <i>Different starting temperatures of water will affect final temperature</i></p> <p>Same heater used to heat both cans  <i>Both cans heated by the same power output</i></p> <p>Both cans have lids  <i>Reduces convection from both cans</i></p> <p>Both cans contain water  <i>If different liquids used, the temperature rise would be different</i></p> <p>Both cans identical [size / material], apart from colour  <i>Different sizes / materials may absorb radiation differently</i></p> <p>Both cans heated for the same time [8 min]  <i>Energy from the heater same for both cans</i></p> <p><b>5–6 marks</b>  Identify 3 controlled variables <b>with</b> correct explanations.  <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>	3	3		6		6

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				<p><b>3–4 marks</b> At least 3 controlled variables <b>or</b> correct explanations. <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><b>1–2 marks</b> Identified up to 2 controlled variables <b>or</b> correct explanations. <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><b>0 marks</b> – No attempt made or no response worthy of credit.</p>						
	(b)	(i)		<p>Correctly plotted point at (5, 25) &lt; small square tolerance (1) Best fit curve from 1 – 8 minutes &lt; small square tolerance (1) Don't accept thick, wispy, disjointed, double lines</p>		2		2		2
		(ii)		<p>The black can has a {bigger / faster / higher} temperature [rise] (1) Black surfaces are {better absorbers / poor reflectors} [of heat radiation] (1)  N.B. converse arguments accepted</p>			2	2		2
				<b>Question 5 total</b>	<b>3</b>	<b>5</b>	<b>2</b>	<b>10</b>	<b>0</b>	<b>10</b>

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)			33 000 – 9 000 (1 for either figure given) = 24 000 [kilotonnes] (1) Award 1 mark for an answer of 24 [kilotonnes]		2		2	2	
	(b)			2008 <b>and</b> 2009		1		1	1	
	I			<b>Any 2 × (1) from:</b> <ul style="list-style-type: none"> <li>Decreased climate change / extreme weather</li> <li>Reduction in global warming / greenhouse gases</li> <li>Reduction in rising sea levels / melting icecaps</li> <li>Less danger to habitats / reduction in extinction of some species</li> </ul> N.B. Don't accept stop in any of the above Reference to pollution treat as neutral	2			2		
	(d)	(i)		Nuclear power stations <u>emit no CO<sub>2</sub></u> (1) so the line should be on 0 (1)			2	2		
		(ii)		Useful energy transferred = 185 (units) (1 – appearing anywhere) $= \frac{185}{500} [x 100] = 37[\%] (1) \text{ so disagree}$ <b>Alternative:</b> $\frac{315}{500} [x 100] = 63\%$ Efficiency = 100 – 63 (1) = 37[%] (1) so disagree <b>N.B.</b> Award 1 mark for an answer of 0.37  <b>Alternative:</b> 63% of 500 = 315 (1) This is wasted energy (1) so disagree			2	2	2	

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
				<b>Award 2 marks for all of the following:</b> $\frac{315}{500} \times 100 = 63\%$ , but this is the inefficiency (2) so disagree <b>Conclusion must be present to award 2 marks</b>						
				<b>Question 6 total</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>9</b>	<b>5</b>	<b>0</b>

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)			At least 1 wave in deep water joining correctly to a shallow water wavefront (1) A minimum of 3 wavefronts shown perpendicular to wave direction by eye (1) Bigger wavelength in deep water must be consistent <b>and</b> a minimum of 3 wavefronts shown (1)		3		3		3
	(b)			The {wavelength increases / wave[front]s are further apart} in deeper water (1) Frequency is constant (1) and <u>with reference to <math>v = f\lambda</math></u> , speed increases so agree (1)			3	3		3
				<b>Question 7 total</b>	<b>0</b>	<b>3</b>	<b>3</b>	<b>6</b>	<b>0</b>	<b>6</b>

## FOUNDATION TIER

### SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	Marks Available					
	AO1	AO2	AO3	Total	Maths	Prac
<b>1</b>	6	0	0	6	0	0
<b>2</b>	5	8	0	13	8	0
<b>3</b>	4	1	1	6	2	6
<b>4</b>	4	4	2	10	3	10
<b>5</b>	3	5	2	10	0	10
<b>6</b>	2	3	4	9	5	0
<b>7</b>	0	3	3	6	0	6
<b>Total</b>	<b>24</b>	<b>24</b>	<b>12</b>	<b>60</b>	<b>18</b>	<b>32</b>