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# **GCSE MARKING SCHEME**

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**SUMMER 2023**

**GCSE  
SCIENCE (DOUBLE AWARD) – UNIT 6  
PHYSICS  
FOUNDATION TIER  
3430U60-1**

## **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 6 – PHYSICS 2****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)			protostar (1) → <i>main sequence</i> → red giant (1) → white dwarf (1) Answers must be in the correct order	3			3		
	(b)			Tick in boxes 1 and 4 i.e. Gas pressure (1) Gravity (1) Lose 1 mark for each additional tick	2			2		
				<b>Question 1 total</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>0</b>

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
2	(a)		B = constant velocity (1) C = accelerating (1) D = decelerating (1) Ignore any ticks in row A. More than one tick in a row no marks can be awarded.		3		3		
	(b)	(i)	10 [m/s]		1		1	1	
		(ii)	4 [m/s]		1		1	1	
		(iii)	20 [s]		1		1	1	
	(c)		6 selected seen anywhere (1) 10 selected seen anywhere (1) $\frac{6}{10} = 0.6$ [m/s <sup>2</sup> ] (1) N.B. $\frac{10}{6} = 0.6$ [m/s <sup>2</sup> ] don't award the last mark	1	1		3	3	
	(d)		Substitution: $\frac{270}{50}$ (1) = 5.[4] [m/s] (1)	1	1		2	2	
			<b>Question 2 total</b>	<b>2</b>	<b>9</b>	<b>0</b>	<b>11</b>	<b>8</b>	<b>0</b>

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			Helium nucleus	1			1		
	(b)			Alpha [particles] (1) can't get through the <u>detector / air</u> (1) Accept for 2 <sup>nd</sup> mark can't travel that far	1	1		2		
	(c)			[Gamma] would not be absorbed by smoke / only absorbed by lead (1) Because they are very penetrating / they are low ionising / so the current would not change (1)	1	1		2		
	(d)	(i)	I	95 (1) 0 (1)	1	1		2		
			II	94 [protons]		1		1		
			III	147 [neutrons]		1		1		
		(ii)		Beta particle	1			1		
				<b>Question 3 total</b>	<b>5</b>	<b>5</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>0</b>

Question		Marking details	Marks Available					
			AO1	AO2	AO3	Total	Maths	Prac
4	(a)	<p><b>Indicative content:</b>  <b>Apparatus set-up:</b>            Set up the clamp.            Suspend the spring from the clamp.            Place a ruler in a [vertical] position alongside the spring.</p> <p><b>Method:</b>            Record the original length of the spring.            Attach the 100 g mass hanger.            Record the length of the spring with the 100 g mass hanger.            Add a further 100 g to the spring and record the new length.            Repeat until all masses have been added.            Take repeat readings.</p> <p><b>Analysis:</b>            Calculate the mean length for each mass added.            Calculate the extension for each mass added.            Plot a graph of force / mass against extension.</p> <p><b>5–6 marks</b>            Description of the apparatus set-up, method and analysis.  <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><b>3–4 marks</b>            Description of 2 out of 3 of the apparatus set-up, the method or the analysis <b>or</b> a limited description of all 3.  <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>	6			6		6



Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
			<p><b>1-2 marks</b> Description of 1 out of 3 of the apparatus set-up, the method or the analysis <b>or</b> a limited description of 1 or 2 areas. <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> <i>No attempt made or no response worthy of credit.</i></p>						
	(b)	(i)	<p>15 [cm] <b>ecf</b> can't be applied for an answer of 0 here in the next 2 parts</p>		1		1		1
		(ii)	<p>Substitution: <math>F = 0.8 \times 15</math> (<b>ecf</b>) (1) = 12 [N] (1)</p>	1	1		2	2	2
		(iii)	<p>Mass = <math>\frac{12(\mathbf{ecf})}{10}</math> (1) = 1.2 [kg] (1)</p>	1	1		2	2	2
			<b>Question 4 total</b>	<b>8</b>	<b>3</b>	<b>0</b>	<b>11</b>	<b>4</b>	<b>11</b>

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		0.26		1		1		1
		(ii)		$\frac{0.52 + 0.54}{2} \text{ (1)}$ = 0.53 [ignores anomaly] so Tom is correct (1)  <b>Alternative:</b> $\frac{0.52 + 0.54 + 0.26}{3} \text{ (1)}$ [= 0.44] but this includes the anomaly so Tom is correct (1) Conclusion must be present to award 2 marks			2	2	2	2
	(b)			Selecting a pair of cases with doubling e.g. 1 to 2 <b>or</b> their corresponding speeds (1) if speed doubles it should be e.g. 1.7 to 3.4 <b>or</b> 2.3 <u>isn't double</u> 1.7 (1) [so Tom is wrong]  <b>Alternative:</b> Speed doubles from 1.7 to 3.4 (1) but cake cases don't double from 1 to 2 <b>or</b> it increases from 1 to 4 (1) [so Tom is wrong]			2	2		2
	(c)	(i)		uncertainty = $\frac{0.48 - 0.44}{2} \text{ (1)}$ = 0.02 [s] (1)	1	1		2	2	2
		(ii)		Human error in timing / reaction time	1			1		1
				<b>Question 5 total</b>	<b>2</b>	<b>2</b>	<b>4</b>	<b>8</b>	<b>4</b>	<b>8</b>

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		Alcohol / drugs / old age / tiredness Accept <u>longer</u> reaction time <b>or</b> use of mobile phones Don't accept poor visibility	1			1		
		(ii)		Icy or wet road / worn brakes / worn tyres Accept <u>greater</u> mass Don't accept weather not qualified	1			1		
	(b)			Thinking distance will halve from 12 to 6 [m] (1) Braking distance {will be $\frac{1}{4}$ / is 6 not 12 [m] / decreases from 24 to 6 [m] which is not a half} (1) Stopping distance {will be $\frac{1}{3}$ / is 12 not 18 [m] / decreases from 36 to 12 [m] which is not a half} (1)			3	3		
				<b>Question 6 total</b>	<b>2</b>	<b>0</b>	<b>3</b>	<b>5</b>	<b>0</b>	<b>0</b>

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)	(i)		Because {decay / dice throwing} is random / this smooths out fluctuations in the data / reduces effect of anomalies			1	1		1
		(ii)		1 in 8 should decay <b>or</b> $\frac{1}{8}$ of 500 = [62.5 on each throw] (1) So about 60 should be removed <b>or</b> $500 - 62.5 = 437.5$ (1)			2	2	2	2
	(b)	(i)		All 5 points correctly plotted < 1 small square tolerance (2) 4 points correctly plotted < 1 small square tolerance (1) 3 or less points correctly plotted < 1 small square tolerance (0) Smooth curve of best fit between 0 – 8 throws (1)		3		3	3	3
		(ii)		<b>At least 1</b> construction line shown on graph (1) Value correct from candidate's graph – expect 5.1 [throws] (1) If answer is exactly 5.0 accept 5		2		2		2
		(iii)		Fewer dice will decay [on each throw] / 1 in 10 decay [on each throw] / only 50 decay [on the 1 <sup>st</sup> throw] / lower chance of decay [on each throw] (1) Accept converse argument so it will take more throws to remove $\frac{1}{2}$ / so the half-life is longer (1) [so disagree]			2	2		2
				<b>Question 7 total</b>	<b>0</b>	<b>5</b>	<b>5</b>	<b>10</b>	<b>5</b>	<b>10</b>

**FOUNDATION TIER**  
**SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES**

Question	Marks Available					
	AO1	AO2	AO3	Total	Maths	Prac
<b>1</b>	5	0	0	5	0	0
<b>2</b>	2	9	0	11	8	0
<b>3</b>	5	5	0	10	0	0
<b>4</b>	8	3	0	11	4	11
<b>5</b>	2	2	4	8	4	8
<b>6</b>	2	0	3	5	0	0
<b>7</b>	0	5	5	10	5	10
<b>Total</b>	<b>24</b>	<b>24</b>	<b>12</b>	<b>60</b>	<b>21</b>	<b>29</b>