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# **GCSE MARKING SCHEME**

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**SUMMER 2019**

**PHYSICS UNIT 6 FOUNDATION (DOUBLE AWARD)  
3430U60-1**

## **INTRODUCTION**

This marking scheme was used by WJEC for the 2019 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**

#### **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)			Red giant (1) white dwarf (1) top diagram in this order Supergiant (1) neutron star (1) lower diagram in this order	4			4		
	(b)	(i)		Equal to (1)	1			1		
		(ii)		Fusion (1)	1			1		
		(iii)		Supernova (1) Solar system (1)	2			2		
				<b>Question 1 total</b>	<b>8</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>0</b>	<b>0</b>

Question			Marking details				Marks Available				
							AO1	AO2	AO3	Total	Maths
2	(a)		Alpha radiation → electromagnetic wave Beta radiation → helium nuclei Gamma radiation → high energy electrons	3 correct 1 or 2 correct 0 correct	2 marks 1 mark 0 mark	2			2		
	(b)		<b>Indicative content:</b> <b>Collecting data</b> Measure the background count of the room for 2 minutes. Using the tongs hold a source close, e.g. 2-3 cm to the GM tube and record the count for the same time. Now place the piece of paper between the source and GM tube <b>or</b> increase the distance in suitable intervals and record the count for 2 minutes. Repeat this technique for the other 2 sources. <b>Analysing data</b> The alpha source will have a count rate that reduces to background count (or 0 if background subtracted) when paper absorber present or distance increased e.g. 30 cm. The beta source will have a count rate that doesn't change when paper is used as absorber or distance increased e.g. 30 cm. The alpha/beta source will have a count rate that decreased when the paper absorber is inserted or distance increased but is higher than the background count.			3	3		6		6

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
				<p><b>5-6 marks</b> Detailed description of both collecting data <b>and</b> analysing data for identification of the 3 sources. <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> Detailed description of either collecting data <b>or</b> analysing data for identification of the 3 sources. <b>Or</b> limited description of both collecting data <b>and</b> analysing data for identification of 2 of the sources. <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> Limited description of either collecting data <b>or</b> analysing data for identification of the 3 sources. <b>Or</b> limited description of both collecting data <b>and</b> analysing data for identification of 1 of the sources. <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>Question 2 total</b>	<b>5</b>	<b>3</b>	<b>0</b>	<b>8</b>	<b>0</b>	<b>6</b>

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
3	(a)		A to B (1)		1		1		
	(b)		$a = \frac{(6-0)}{3}$ (1-substitution) = 2 (1-answer) m/s <sup>2</sup> (1) Accept m/s/s Or other valid pairs e.g. $\frac{2}{1}, \frac{4}{2}, \frac{3}{1.5}$ <b>Alternative:</b> $a = \frac{(600-0)}{3}$ (1-substitution) = 200 (1-answer) cm/s <sup>2</sup> (1) Accept cm/s/s	1	1		3	2	
	(c)		$F = 110 \times 2$ ( <b>ecf</b> ) (1-substitution) = 220 [N] (1)	1	1		2	2	
	(d)		9 (1) [-0.6 =] 8.4 (1) [s] N.B. Award two marks for 8.4 [s] if no workings shown Award 1 mark of 9 [s] on the answer line	1	1		2	2	
	(e)		Constant velocity (1) For only 6 s (1) <b>Alternative:</b> It accelerated (1) For 3 s (1) <b>Alternative:</b> It decelerated (1) For 2 s (1) <b>Alternative:</b> It accelerated and decelerated <b>or</b> its speed changed <b>or</b> it wasn't at a constant speed (1) For 5 s (1) Disagree – no mark on its own but is required to award full marks			2	2	2	



Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
	(f)		<p>On an icy pavement it is harder to slow down / it's slippery / less friction (1)            Don't accept: icy            So the stopping time is longer so the claim is correct (1)  <b>Alternative for the 2<sup>nd</sup> mark:</b>            So the stopping distance is longer / area is bigger so the claim is correct (1)  <b>Alternative for the 2<sup>nd</sup> mark:</b>            So the deceleration / slope is less so the claim is correct (1)</p>			2	2		
			<b>Question 3 total</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>12</b>	<b>8</b>	<b>0</b>

Question				Marking details	Marks Available						
					AO1	AO2	AO3	Total	Maths	Prac	
4	(a)			Distance travelled / length of track / 2.5 m Accept: [same] car / [same] track	1			1			1
	(b)	(i)		Mean speed = $\frac{2.5}{4.0}$ (1-substitution) = 0.625 (1) [m/s] accept 0.63 and 0.6 but <b>not</b> 0.62 [m/s] Answer of 0.62 on the answer line with no workings shown award 1 mark	1						
		(ii)	I.	The [mean] time or it decreases (1) at a decreasing rate / at smaller intervals (1) N.B. treat any reference to numbers as neutral				2	2	2	2
			II.	Increases accept quicker or faster				1	1	1	1
	(c)	(i)		It [0.2 s] is not the smallest range / 0.1 s is the smallest range (1) <u>Most repeatable data is for 10 cm</u> (1)				2	2	2	2
		(ii)		Reference to human error or reaction times (1) so the timing is closer to the true value / more accurate (1) N.B. treat any reference to precision or reliability as neutral				2	2		2
				<b>Question 4 total</b>	<b>2</b>	<b>4</b>	<b>4</b>	<b>10</b>	<b>7</b>	<b>10</b>	

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			$\frac{550}{10} = 55$ [kg]	1			1	1	
	(b)	(i)		5 600 [J] Accept $5.6 \times 10^3$	1			1	1	
		(ii)		$\frac{5\,600(\text{ecf})}{2.8}$ (1-substitution) = 2 000 (1) [N] N.B. Award 1 mark for $\frac{5.6}{2.8}$ unless the 5.6 is an <b>ecf</b> from (i) <b>or</b> 2 [N] on the answer line	1			2	2	
		(iii)		Same KE / same work done / same velocity (1) Smaller distance or time <u>to stop</u> / greater deceleration (1) Larger [mean] force [on woman] (1) Disagree or it is less safe – no mark on its own but is required to award full marks		1	1 1	3	2	
				<b>Question 5 total</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>7</b>	<b>6</b>	<b>0</b>

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)	174, 180, 194, 196 – all correct		1		1	1	1
		(ii)	50		1		1	1	1
		(iii)	3 [throws]		1		1	1	1
	(b)		14 (1) 7 (1)		2		2	2	
	(c)	(i)	800 in every cell in the second column (1) 130, 70, 40, 20, 10 in last column (1)		2		2	2	
		(ii)	Plots at (15,130), (20,70), (25,40), (30,20), (35,10) <b>ecf</b> - within a tolerance of $\pm <1$ small square 2 marks for all 5 plots correct 1 mark for 4 plots correct 0 marks for 3 or fewer plots correct Smooth curve must extend back to 800 judge quality of curve in the region 10 – 35 thousand years it must pass within $\pm <1$ small square of these points (1) Don't accept double lines, wispy, disjointed curves		3		3	2	
	(d)	(i)	It is the time taken to halve (1) the {number of radioactive particles or atoms or nuclei / activity / mass / amount of the substance} (1)	2			2		
		(ii)	$6 \pm 0.5$ [thousand years]		1		1	1	

Question				Marking details	Marks Available							
					AO1	AO2	AO3	Total	Maths	Prac		
	(e)			[The 60 (6) million fall [out of 800 (80) million] in carbon nuclei or rise in nitrogen nuclei] occurs at about 700 years (1) Which is less than 2 000 years so the claim is incorrect (1) <b>Alternative:</b> After 2 000 years approx. 160 / 170 (16 / 17) million [out of 800 (80) million] nuclei of carbon will have decayed / nitrogen nuclei produced (1) So 60 (6) million nuclei will have decayed in much less time so the claim is incorrect (1)			2	2	2			
				<b>Question 6 total</b>	<b>2</b>	<b>11</b>	<b>2</b>	<b>15</b>	<b>12</b>	<b>3</b>		

## FOUNDATION TIER

### SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	8	0	0	8	0	0
2	5	3	0	8	0	6
3	4	4	4	12	8	0
4	2	4	4	10	7	10
5	3	2	2	7	6	0
6	2	11	2	15	12	3
<b>TOTAL</b>	<b>24</b>	<b>24</b>	<b>12</b>	<b>60</b>	<b>33</b>	<b>19</b>