



GCSE MARKING SCHEME

SUMMER 2019

**PHYSICS COMPONENT 2 – FOUNDATION TIER
C420U20-1**

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 PHYSICS
COMPONENT 2 – APPLICATIONS IN PHYSICS
FOUNDATION TIER
MARK SCHEME
GENERAL INSTRUCTIONS

Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (except for the extended response question).

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

SECTION A

Question				Marking details	Marks available						
					AO1	AO2	AO3	Total	Maths	Prac	
1	(a)	(i)		30°		1		1	1	1	
		(ii)		30°		1		1	1	1	
	(b)	(i)		Angle of incidence = angle of reflection			1	1			1
		(ii)		Take a range of measurements / series of different angles Don't accept repeat only	1			1			1
				Question 1 total	1	2	1	4	2	4	

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)		Ohms / Ω	1			1		1
		(ii)		$I = \frac{12}{103}$ (1) substitution $I = 0.117$ or 0.12 or 0.1165 [A] (1) Accept 0.116 [A] for 1 mark only	1	1		2	1	2
	(b)	(i)		Number of lamps	1			1		1
		(ii)		Potential difference or voltage / type of lamp	1			1		1
	(c)	(i)		Axes labelled correctly with units (1) ecf on unit of resistance from the table. Appropriate scales chosen that use at least $\frac{1}{2}$ of graph paper (1) Either: All plots correctly plotted with < 1 small square tolerance (2) Ignore missing zero plot at origin 1 error (1) >1 error (0) Or: bar chart with narrow bars centred on each number, not touching. All bars correctly plotted with < 1 small square tolerance (2) 1 error (1) >1 error (0)	1 1	2		4	4	4
		(ii)		As the number of lamps increases the resistance increases (1) in equal amounts (1)		2		2		2
		(iii)		Value of 158 ± 2 [Ω]			1	1	1	1

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)	(i)		Second lamp added in parallel		1		1		1
		(ii)		Set p.d. at 12 V and record current / measure potential difference and current (1) Calculate total resistance (1) Repeat for different numbers of lamps [and compare] (1)			3	3		3
				Question 2 total	6	6	4	16	6	16

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		8.5 - 2.5 = 6.0 [cm]		1		1		1
		(ii)		$k = \frac{2}{0.06}$ or $\frac{2}{6}$ (1) substitution Conversion (1) $k = 33.3$ [N/m] (1) Answer = 0.3 [N/m] award 2 marks only	1	1 1		3	2	3
	(b)			Indicative content: Method 1. Record the original length of the spring. 2. Suspend the spring from the clamp and attach the 100 g mass hanger. 3. Record the new length of the spring. 4. Add a further 100 g to the spring and record the new length. 5. Repeat steps 2-3 until a total mass of e.g. 700 g has been added. 6. Repeat steps 1-5 once more or measure whilst unloading. Analysis 1. Calculate the mean length for each mass added. 2. Calculate the mean extension for each mass added. 3. Plot a graph of force against mean extension (100 g = 1 N) 4. Determine whether the spring obeys Hooke's law or not, e.g. if it is a straight line through the origin. OR – Calculate the spring constant for each force and compare to see if it is the same.	6			6		6

Question				Marking details	Marks available						
					AO1	AO2	AO3	Total	Maths	Prac	
				<p>5-6 marks Detailed description of the method and how to analyse the results. <i>There is a sustained line of reasoning which is coherent, substantiated and logically structured. The information included in the response is relevant to the argument.</i></p> <p>3-4 marks Either a detailed description of the method or how to analyse the results OR a limited description of both. <i>There is a line of reasoning which is partially coherent, supported by some evidence and with some structure. Mainly relevant information is included in the response but there may be some minor errors or the inclusion of some information not relevant to the argument.</i></p> <p>1-2 marks A limited description of the method or how to analyse the results. <i>There is a basic line of reasoning which is not coherent, supported by limited evidence and with very little structure. There may be significant errors or the inclusion of information not relevant to the argument.</i></p> <p>0 marks No attempt made or no response worthy of credit.</p>							
				Question 3 total	7	3	0	10	2	10	

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		[Clockwise] moment = [clockwise] force × [perpendicular] distance [to the pivot] / 3 N force × 4 or it causes the ruler to <u>turn</u> clockwise	1			1		1
		(ii)		$6 \times 2 = 4 \times 3$ [so correct]			1	1		1
	(b)			12 = 5 × distance (1) substitution Distance = $\frac{12}{5} = 2.4$ [cm] (1)	1	1		2	2	2
				Question 4 total	2	1	1	4	2	4

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		Energy transferred = 25×480 (1) = 12 000 [J] (1) Alternative: Energy transferred = $5\,455 \times 0.2 \times 11$ (1) = 12 001 [J] (1)	1	1		2	2	2
		(ii)		$\Delta\theta = 21$ (1) $c = \frac{24\,000}{0.2 \times 21}$ (1) $c = 5\,714$ [J / kg °C] (1)	1	1		3	3	3
	(b)	(i)	I	Close to the true value	1			1		1
			II	Repeated values from different groups are close together	1			1		1
		(ii)		Insulate the beaker / add a lid (1) to reduce heat loss to the surroundings (1)			2	2		2
	(c)			When the power doubles from 25 W to 50 W the temperature rise increases from 11 to 21 (1) This is almost double so the conclusion is valid / this is not double so the conclusion is not valid (1)			2	2		2
				Question 5 total	4	3	4	11	5	11

SECTION B

Question		Marking details		Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
6	(a)		Fossil fuel use dropped from 71 % to 52 % / coal use dropped 7 % <u>and</u> gas dropped 12 % (1) Less greenhouse gases added to the atmosphere / so less CO ₂ adding to greenhouse effect or global warming or climate change (1)	1	1		2		
	(b)		26 [GW]		1		1		
	(c)	(i)	5 000 [km ²]		1		1	1	
		(ii)	1 045 000 [units]		1		1	1	
	(d)		Smaller (1) Larger power output (1) More reliable (1) Don't accept they don't spoil the view	1		1 1	3		
	(e)	(i)	Efficiency = $\frac{220}{1000}$ (1) subs = 0.22 (1) [accept 22 %]	1	1		2	1	
		(ii)	Power from 4 m ² = 220 × 4 = 880 [W] (1) Current = $\frac{880}{230}$ (ecf) (1) subs = 3.8 [A] (1) Answer = 0.956 [A] award 2 marks	1	1 1		3	2	

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(iii)		Energy = $880 \text{ ecf} \times 6$ (1) = $5280 = 5000$ [Wh] (1) or 5 kWh answer must be to 1 sig fig		2		2	2	
				Question 6 total	4	9	2	15	7	0

FOUNDATION TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

	Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
SECTION A	1	1	2	1	4	2	4
	2	6	6	4	16	6	16
	3	7	3	0	10	2	10
	4	2	1	1	4	2	4
	5	4	3	4	11	5	11
SECTION B	6	4	9	2	15	7	0
	TOTALS	24	24	12	60	24	45