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# GCSE MARKING SCHEME

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**SUMMER 2018**

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

## **INTRODUCTION**

This marking scheme was used by WJEC for the 2018 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**  
**SUMMER 2018 MARK SCHEME**  
**COMPONENT 2 – Applications in Physics**  
**FOUNDATION TIER**

**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)			Size of magnet. Number of steel paper clips picked up. Size of paper clips  3 correct = 2 marks 1 or 2 correct = 1 mark 0 correct = 0 mark		2			2		2
	(b)			Big magnet picks up fewer paper clips [than the small magnet] (1) It must be weaker [than the small magnet] so prediction wrong (1) Accept converse.			2	2		2	
	(c)			<b>Any (1) from:</b> <ul style="list-style-type: none"> <li>• Use more different sized magnets</li> <li>• Measure the 'size' of the magnets</li> <li>• Use smaller identical paper clips</li> <li>• Repeat experiment [to get a mean value for paper clips]</li> </ul>			1	1		1	
				<b>Question 1 total</b>	<b>2</b>	<b>0</b>	<b>3</b>	<b>5</b>	<b>0</b>	<b>5</b>	

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)		Radioactive decay is random	1			1		1
		(ii)		$\frac{74+76+72+75+74+73}{6} = \frac{444}{6}$ (1 sum → 444) = 74 [cpm] (1)	1	1		2	2	2
		(iii)		74 <b>ecf</b> – 23 = 51 [cpm]		1		1		1
	(b)			Only background count recorded [when wrapped in Al] (1) <u>Both</u> alpha and beta are absorbed by aluminium (1) The source could emit beta and/or alpha so disagree (1)			3	3		3
				<b>Question 2 total</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>7</b>	<b>2</b>	<b>7</b>

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			Heat and light (either order)	1			1		1
	(b)			Voltmeter	1			1		1
	(c)	(i)		225 [J]	1			1	1	1
		(ii)		Substitution: 225 <b>ecf</b> = power $\times$ 8.7 (1) Power = 25.9 [W] (1)	1	1		2	2	2
		(iii)		0.08 $\times$ 25 = 2 [W] (1) Lamp not rejected as power rating in the range 27 W to 23 W (1) ( <b>ecf</b> (c)(ii)) <b>Alternative;-</b> $\frac{(25.9 - 25)}{25} \times 100 = 3.6\%$ (1) Lamp not rejected as 3.6% is less than 8% (1) ( <b>ecf</b> (c)(ii))			2	2	1	2
				<b>Question 3 total</b>	<b>4</b>	<b>1</b>	<b>2</b>	<b>7</b>	<b>4</b>	<b>7</b>

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			45 [cm <sup>3</sup> ]	1			1		1
	(b)	(i)		50 – 45 <b>ecf</b> = 5 [cm <sup>3</sup> ]		1		1		1
		(ii)		Substitution: $\frac{15}{5 \text{ ecf}}$ (1) Volume = 3 [g/cm <sup>3</sup> ] (1)	1	1		2	2	2
	(c)	(i)		D		1		1		1
		(ii)		A and E		1		1		1
	(d)			Same answer as to (b) (ii)	1			1		1
				<b>Question 4 total</b>	<b>3</b>	<b>4</b>	<b>0</b>	<b>7</b>	<b>2</b>	<b>7</b>

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
5	(a)		Do not touch lamp / switch off when not in use / leave to cool before packing away	1			1		1
	(b)		<p><b>Indicative content:</b> Place glass block on the A4 paper and draw round it. Use the protractor to measure and mark the position of the normal and the incident rays at, e.g. 20°, 40°, 60°, 80°. Shine an incident ray at, e.g. 20° to the normal into the glass block. Carefully mark with a pencil the path of the ray as it leaves the block. Switch off ray box and remove the glass block. Using a ruler draw a straight line between the entry and exit points to show the ray path inside the block. Measure and record the angle of refraction. Repeat for the incident rays at 40°, 60° and 80°. Record data in a table. The experiment could be repeated and mean values obtained for each angle of incidence</p> <p><b>5-6 marks</b> Detailed and clear instructions that could be followed successfully. This may be enhanced with a correctly labelled diagram. A range and intervals for incident angle must be stated. All equipment used correctly. Repeat readings mentioned. <i>There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. The information included in the response is relevant to the argument.</i></p> <p><b>3-4 marks</b> Description of experiment that could be followed but some changes would be needed. Some incident angles referred to and most of the equipment used correctly. Repeats not mentioned. <i>There is a line of reasoning which is partially coherent, largely relevant, 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>	6			6		6



Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				<p><b>1-2 marks</b> The instructions would require some significant additions or changes for the investigation to be carried out. No mention of possible angles. <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><b>0 marks</b> No attempt made or no response worthy of credit.</p>						
	(c)	(i)		5.0 ( $\pm 0.1$ ) [cm]	1			1		1
		(ii)		3 converging rays, focus closer to lens than thin lens	1			1		1
		(iii)		2 outside diverging rays, middle ray straight through [ignore virtual rays to left of lens]	1			1		1
				<b>Question 5 total</b>	<b>10</b>	<b>0</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>10</b>

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		°C (1)	1			1		1
		(ii)		Circle (60,112)	1			1		1
		(iii)		Good fit straight line, ignoring the point at (60,112) (1)		1		1		1
		(iv)		Temperature increases, pressure increases (1) at a constant [accept: steady] rate (1) Accept converse.		2		2		2
	(b)			Extrapolate with straight line across to 90 kN/m <sup>2</sup> (1) Reading from candidate's graph: expect 11 – 15 °C [°C] (1) NB. No indication on graph → 0 marks		2		2	2	2
	(c)			Substitution: pressure = $\frac{100}{5.3 \times 10^{-4}}$ (1) = $1.89 \times 10^5$ [N/m <sup>2</sup> ] (1)	1	1		2	2	2
				<b>Question 6 total</b>	<b>3</b>	<b>6</b>	<b>0</b>	<b>9</b>	<b>4</b>	<b>9</b>

## SECTION B

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)	(i)		More space between galaxies / galaxies moved apart Not: the universe has expanded		1		1		
		(ii)		Both moved away from C [or the distances have both increased] (1) A more than D [accept: A faster than D](1) NB 'A has moved away more / faster than D' → both marks		2		2		
		(iii)		B→E→A→D		1		1		
		(iv)		G2 <b>ecf</b>		1		1		
	(b)			E6 (1) SBb (1)			2	2		
	(c)	(i)		Scales: $y$ -axis 200 per 2 cm square and $x$ -axis 0.4 [or 0.5] per 2 cm square (1) 6 plots correct (2) < 1 square tolerance [ignore (0,0)] 5 plots correct (1) 4 or less (0) Suitable straight line through origin (1) [not through extreme points]		4		4	4	
		(ii)		Suitable $y$ and $x$ value chosen (1) Answer in line with graph (1)		2		2	2	
		(iii)		May draw a different line of best fit (1) so gradient will be different (1)			2	2		
				<b>Question 7 total</b>	<b>0</b>	<b>11</b>	<b>4</b>	<b>15</b>	<b>6</b>	<b>0</b>

## COMPONENT 2 – Applications in Physics

### FOUNDATION TIER

#### SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

	Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
<b>Section A</b>	1	2	0	3	5	0	5
	2	2	2	3	7	2	7
	3	4	1	2	7	4	7
	4	3	4	0	7	2	7
	5	10	0	0	10	0	10
	6	3	6	0	9	4	9
<b>Section B</b>	7	0	11	4	15	6	0
	<b>TOTAL</b>	<b>24</b>	<b>24</b>	<b>12</b>	<b>60</b>	<b>18</b>	<b>45</b>