

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 questions).

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.

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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 statements.

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)			14 and 30 in the table	1			1		1
	(b)			16 (ecf from (i)) [cm ³]		1		1		1
	(c)			Substitution: $\frac{40}{16(\text{ecf})}$ (1) Density = 2.5 [g/cm ³] (1)	1			2	2	2
				Question 1 total	2	2	0	4	2	4

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Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)	All 5 points plotted correctly $\pm \frac{1}{2}$ small square division award 2 marks 4 points plotted correctly $\pm \frac{1}{2}$ small square division award 1 mark Straight line of best fit (1)		3		3	3	3
		(ii)	Method clear from graph i.e. line drawn at 5.0 cm (1) Weight = 2.5 [N] (ecf from graph) (1)		2		2	1	2
		(iii)	Use of the equation (or by implication): $\text{spring constant} = \frac{\text{force}}{\text{extension}} \text{ (1)}$ Corresponding pair of values selected and substituted into equation (1) Spring constant = 0.5(ecf) [N/cm] (1)	1					
					1		3	2	3
	(b)		Directly (1) Elastically (1) Hooke's (1)	3			3		3
	(c)	(i)	The line is straight OR the extension goes up in equal steps when the force goes up in equal steps		1		1	1	1
		(ii)	Measure length with mass added (1) Subtract length with no mass added (1) Alternative response: Place zero of ruler at bottom of mass (1) Add mass to spring and take the reading (1)		2		2		2
		(iii)	Make sure that the ruler is upright (1) Use a pointer / measure at eye level / place the ruler close to the bottom of the spring (1)			2		2	
			Question 2 total	4	10	2	16	7	16

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			$f = \frac{33}{10}$ or $\frac{1}{0.3}$ Frequency = 3.3 [Hz]		1		1		1
	(b)	(i)		Similar distribution of points each side of it			1	1	1	1
		(ii)		Substitution: $\frac{350}{2.1}$ (1) Speed = 167 [m/s] (1)	1	1		2	2	2
		(iii)		Answer is about half the expected value (1) Because the times are for the sound to travel double the distances shown on the graph (1)			2	2	1	2
	(c)			Similar pattern of results / graphs have a similar shape / both proportional (1) But velocities are different / gradients are different (1)			2	2	1	2
				Question 3 total	1	2	5	8	5	8

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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)	rate of change of velocity / acceleration = $\frac{\text{change in velocity}}{\text{time taken}}$	1			1		
		(ii)	Holes evenly spaced / same distance between holes / same length strips		1		1		1
		(iii)	Time for each strip = $5 \times \frac{1}{50} = \frac{1}{10}$ (0.1) seconds (1) velocity = $\frac{\text{distance}}{\text{time}} = \frac{2}{0.1} = 20 \text{ cm/s}$ (1)		2		2	2	2
	(b)		Selection of: $v = u + at$ (1) Manipulation: $a = \frac{(30 - 20)}{0.1}$ (1) Acceleration = $100 \text{ [cm/s}^2\text{]}$ (1)	1	1		3	2	3
			Question 4 total	2	5	0	7	4	6

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)	A - measures current (1) V - measures voltage (1)	2			2		2
		(ii)	Cause a decrease	1			1		1
		(iii)	Variable resistor	1			1		1
	(b)		<p>Indicative content: A battery is connected in series with a variable resistor, then a parallel arrangement of the lamp and voltmeter is connected in series with this and finally an ammeter is connected in series with the final connection back to the battery to complete the circuit.</p> <p>5–6 marks Detailed and clear instructions that could be followed successfully to set up the circuit by a third party. Components and connections are clearly and accurately referred to. <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 Description of the components OR connections. The instructions could be followed to set up the circuit with some limited changes. Most of the components or connections are referred to. <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> <p>1–2 marks The method would require some significant elaboration or changes for the circuit to be set up a third party. Some components OR connections are referred to. <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 <i>No attempt made or no response worthy of credit.</i></p>	6			6		6
			Question 5 total	10	0	0	10	0	10

SECTION B

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)			Different shape surfaces cause a difference in air pressure (1) So a resultant force is created (1)		2		2		
	(b)	(i)		Identification that radius = 40 m (1) Swept area = 5 027.2 [m ²] Accept 5 027 (1)	1	1		2	1	
		(ii)		Selection of air density value 1.173 (1) Substitution: $\frac{1}{2} \times 1.173 \times 5 027$ (allow ecf) $\times 1 300$ (1) Mean KE / second = 3 832 836 [J/s] (1)	1	1		3	2	
	(c)	(i)	I	Wind speed increases with altitude			1	1		
			II	Power output of a wind turbine depends on wind speed or air density (1) Both wind speed and density vary with altitude (1)			2	2		
		(ii)		Power output varies with air density (1) Which depends on temperature (1)			2	2		
	(d)			Benefits Include references to no fuel costs, renewable resource, no air pollution, no effect on climate Drawbacks Include references to variable wind speed, low power outputs, noise / visual pollution Award a maximum of 2 marks for benefits or for drawbacks	3			3		
				Question 6 total	5	5	5	15	3	0