



Mark Scheme (Results)

October 2025

Pearson Edexcel International Advanced
Subsidiary level In Physics
WPH13/01A

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General Marking Guidance

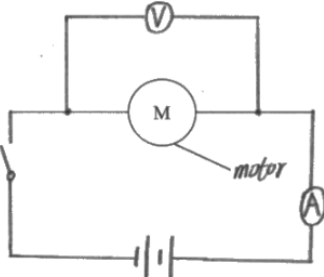
- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Additional Guidance	Mark
1(a)	- Avoid overtightening the jaws of the caliper Or Ensure there are no gaps between the sheets of paper Or Ensure the paper is aligned - Check (and correct) for zero error - Measure (height of all) 500 sheets and divide by 500 - Repeat at different positions and calculate the mean	Allow “layers”, accept reasonable method Accept reasonable method Accept method. Accept “divide by the number of sheets” or formula if number of sheets defined Do not accept “orientations”	4
1(a)(ii)	- Uses uncertainty = 0.005 (mm) - Percentage uncertainty = $8 \times 10^{-3} \%$	Accept 0.01 mm Accept 0.0083%, 0.00833% <u>Example of calculation</u> Uncertainty = $\frac{0.01\text{mm}}{2} = 0.005 \text{ mm}$ Percentage uncertainty = $\frac{0.005\text{mm}}{60.00\text{mm}} \times 100$ = $8.33 \times 10^{-3} \%$	2
1(b)(i)	- Calculates mean for minimum 3 values for width and length - Mean width = 210.24 (mm) and Mean length = 297.03 (mm) - Mean values given to 0.01 mm with correct unit	<u>Example of calculation</u> Mean width = $\frac{(210.20+210.35+210.15+210.25)\text{mm}}{4}$ = 210.2375 mm = 210.24 mm Mean length = $\frac{(297.25+297.00+296.75+297.10)\text{mm}}{4}$ = 297.025 mm = 297.03 mm	3

1(b)(ii)	- Use of $\rho = \frac{m}{V}$ Density = 0.5525 (g cm⁻³) e.c.f. (b)(i)	(1) (1) Accept 5 s.f. <u>Example of calculation</u> $\rho = \frac{2070 \text{ g}}{(21.024 \times 6.000 \times 29.703) \text{ cm}} = 0.5525 \text{ (g cm}^{-3}\text{)}$	2
1(b)(iii)	Zero error in (the reading from) the <u>balance</u>	(1) Accept idea of “taring” the balance but not “balance the reading”.	1
		Total for question 1	12

Question Number	Answer	Additional Guidance	Mark
2(a)(i)	- To ensure sound <u>waves</u> are coherent - Or To ensure sound <u>waves</u> have constant phase (relationship/difference)		1
2(a)(ii)	- Loud sound could damage hearing/ears - Wear ear defenders/plugs/protection - Or Reduce the volume/amplitude of sound (to a safe level) - Or Keep a reasonable distance from the loudspeakers - Or Limit the duration/time of the exposure	Accept eardrums. Accept ear/headphones not ear mask. Do not accept signal generator for loudspeakers.	2
2(b)(i)	- Subtraction of distance between two maxima - Calculates mean from minimum of 3 gaps $w = 0.62 \text{ m}$	<u>Example of calculation</u> Total distance = $3.33 - 0.22 = 3.11 \text{ m}$ Number gaps = 5 $w = \frac{3.11 \text{ m}}{5} = 0.622 \text{ m} = 0.62 \text{ m}$	3
2(b)(ii)	- Use of $w = \lambda D / s$ - Correct value of λ given to nearest cm with correct unit e.c.f. 2(b)(i)	<u>Example of calculation</u> $\lambda = \frac{sw}{D} = \frac{1.10\text{m} \times 0.62\text{m}}{4.0\text{m}} = 0.1705 = 0.17 \text{ m}$	2
2(c)(i)	(As $v = f\lambda$) the frequency would need to be measured - States suitable apparatus to measure frequency	Accept time period for frequency Accept frequency meter, oscilloscope/CRO, sound sensor with datalogger, mobile phone with an app	2

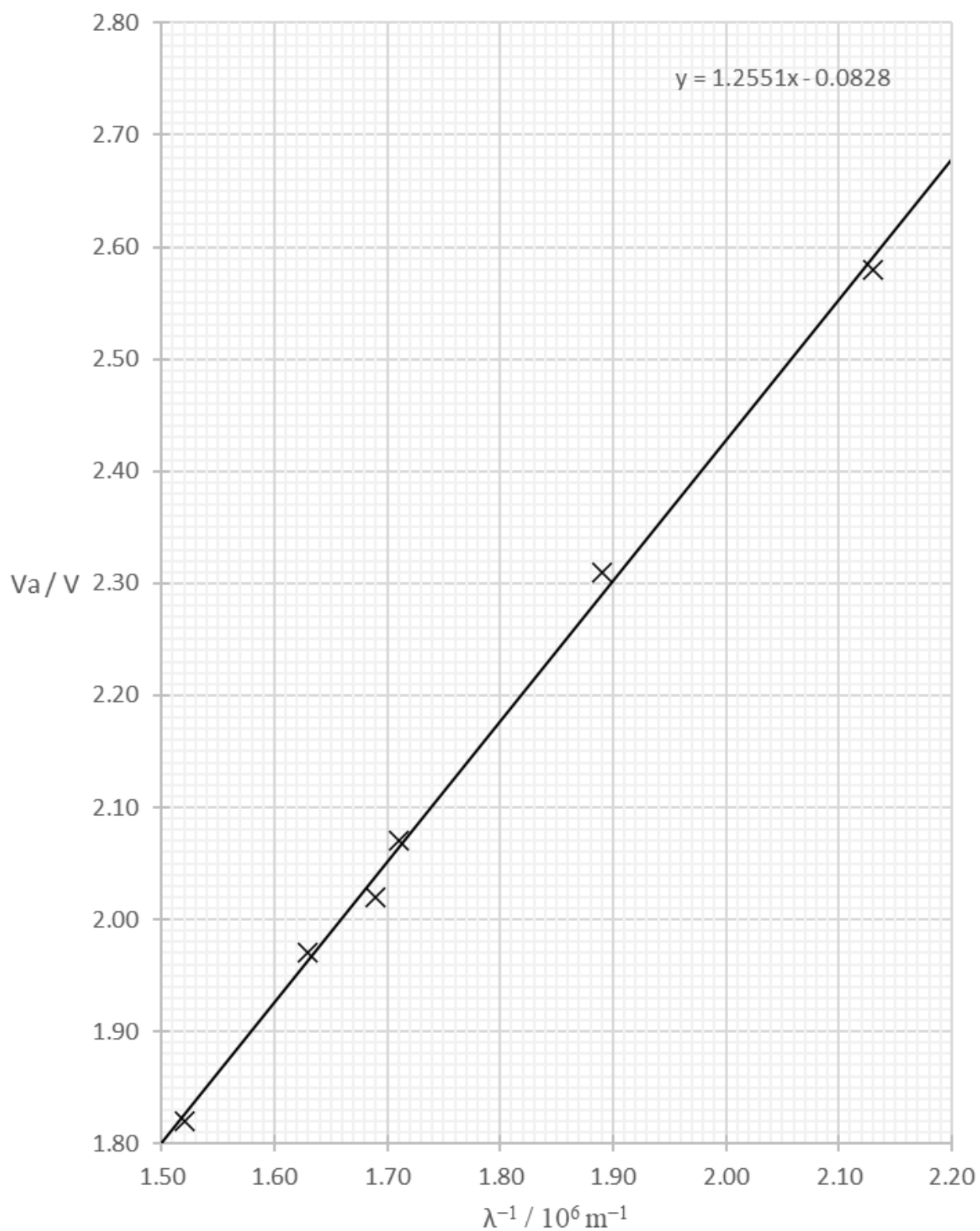
2(c)(ii)	EITHER - As $\lambda = v / f$, λ will increase (1) - As $w = \lambda D / s$, w will increase as f, D and s remain constant (1) MP2 dependent on MP1 OR $w = v D / f s$ (1) - So w will increase as f, D and s remain constant (1) MP2 dependent on MP1	Allow max ONE mark for “w will increase as λ increases as f, D and s remain constant”	2
		Total for question 2	12

Question Number	Answer	Additional Guidance	Mark
3(a)	- Series circuit including battery/cell and switch - Ammeter in series with motor and voltmeter in parallel with motor only	Example of circuit 	2
3(b)(i)	- Clamp/fix the metre rule in position - Ensure the metre rule is vertical using a set square Or Ensure the metre rule is perpendicular to the floor using a set square - Place the metre rule close to the mass Or Read the height from bottom of the mass Or Attach a marker to the mass/string - Take measurements perpendicular to the scale Or Use a set square to read off the scale	Accept spirit level or plumb line. Accept parallel to mass/string. Do not accept “straight” for vertical. Accept close to string/object not height. Do not allow “next to”. Do not accept “horizontally” or “parallel” for perpendicular.	4

3(b)(ii)	- There will be variation in the measurements (1) - So repeat measurements (and calculating a mean) reduces (the effect of) <u>random errors</u>. (1)	Do not accept eliminate/avoid. Do not accept “reduces systematic error and random error”	2
3(c)	EITHER - Power of motor = VI (1) - Power of lifting mass = mgh / t (1) Or power of lifting mass = Fv with $F=mg$ and $v=h/t$ (1) - So efficiency = power of lifting mass / power of lifting motor (1) Or efficiency = $(mgh / t) / VI$ OR - Energy transferred to motor = $VI t$ (1) - Energy transferred to lifting mass = mgh (1) - So efficiency = energy transferred to lifting mass / energy transferred to motor (1) Or efficiency = $(mgh) / (VI t)$	Accept definitions related to power Allow 10 as substitute for t Accept quantities as defined Must be ratio of 2 powers Allow definitions related to energy, e.g. work Allow $t = 10$ Allow gravitational potential energy. Accept quantities as defined Must be ratio of 2 energies	3
		Total for question 3	11

Question Number	Answer	Additional Guidance	Mark																					
4(a)	$V_a = \frac{hc}{e} \frac{1}{\lambda} + \frac{W}{e}$ - Compares to $y = mx + c$ with terms in correct order - Where the gradient = $\frac{hc}{e}$ which is constant Or Where the gradient = $\frac{hc}{e}$ and h, c and e are all constants MP3 dependent on MP1	Allow $V_a = \frac{hc}{e\lambda} + \frac{W}{e}$ Do not accept “m” for gradient unless $\frac{hc}{e}$ linked to the gradient within the answer.	3																					
4(b)(i)	Correct values for $\frac{1}{\lambda}$ Values given consistently to 3 s.f.	Power of 10 in table must be correct. <table><tr><th>$\lambda / 10^{-7} \text{ m}$</th><th>$V_a / \text{V}$</th><th>$1/\lambda / 10^6 \text{ m}^{-1}$</th></tr><tr><td>6.60</td><td>1.82</td><td>1.52</td></tr><tr><td>6.12</td><td>1.97</td><td>1.63</td></tr><tr><td>5.92</td><td>2.02</td><td>1.69</td></tr><tr><td>5.85</td><td>2.07</td><td>1.71</td></tr><tr><td>5.30</td><td>2.31</td><td>1.89</td></tr><tr><td>4.70</td><td>2.58</td><td>2.13</td></tr></table>	$\lambda / 10^{-7} \text{ m}$	V_a / V	$1/\lambda / 10^6 \text{ m}^{-1}$	6.60	1.82	1.52	6.12	1.97	1.63	5.92	2.02	1.69	5.85	2.07	1.71	5.30	2.31	1.89	4.70	2.58	2.13	2
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4(b)(ii)	Axes labelled: y-axis as V_a / V and x-axis as $\frac{1}{\lambda} / 10^6 \text{m}^{-1}$ Or Axes labelled: y-axis as V_a / V and x-axis as $\frac{1}{\lambda} \times 10^{-6} / \text{m}^{-1}$.	Accept power of 10 consistent with table. Do not accept reversed axes.																						

	• Sensible scales for both axes • Data plotted accurately • Reasonable line of best fit drawn	(1) Axes must cover at least half grid, value of small square in 1, 2 or 5 only (2) Plots within 1 mm (1) Straight, plots on both sides of line, no rotation Accept graph in landscape	5
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4(b)(iii)	• Uses large triangle • Uses gradient = $\frac{hc}{e}$ Or Uses $V_a = \frac{hc}{e\lambda} + \frac{W}{e}$ as simultaneous equations • h in range 6.45×10^{-34} to 6.89×10^{-34}, given to 2 or 3 s.f. with units J s	(1) (1) (1)	<u>Example of calculation</u> $\text{gradient} = \frac{2.64 - 1.80}{(2.17 - 1.50) \times 10^6} = 1.25 \times 10^{-6}$ $h = \frac{\text{gradient} \times e}{c} = \frac{1.25 \times 10^{-6} \times 1.60 \times 10^{-19} \text{ C}}{3.00 \times 10^8 \text{ ms}^{-1}}$ $= 6.67 \times 10^{-34} \text{ J s}$	3
4(b)(iv)	• Calculation of percentage difference with 6.63×10^{-34} J s as denominator • Conclusion based on comparison of percentage difference Or Conclusion based on comparing calculated h with 6.63×10^{-34} J s	(1) (1)	<u>Example of calculation</u> $\%D = \frac{(6.67 - 6.63) \times 10^{-34} \text{ Js}}{6.63 \times 10^{-34} \text{ Js}} \times 100 = 0.6 \%$	2
			Total for question 4	15