Pearson

Mark Scheme (Results)

October 2025

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

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General Marking Guidance

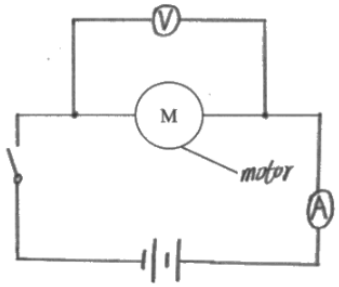
- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should 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	**(1)**	Allow "layers", accept reasonable method Accept reasonable method	
	• Check (and correct) for zero error	**(1)**	Accept method.	
	• Measure (height of all) 500 sheets and divide by 500	**(1)**	Accept "divide by the number of sheets" or formula if number of sheets defined	
	• Repeat at different positions and calculate the mean	**(1)**	Do not accept "orientations"	**4**
1(a)(ii)	• Uses uncertainty = 0.005 (mm)	**(1)**	Accept 0.01 mm	
	• Percentage uncertainty = 8×10^{-3} %	**(1)**	Accept 0.0083%, 0.00833% <u>Example of calculation</u> Uncertainty = $\frac{0.01\text{mm}}{2}$ = 0.005 mm Percentage uncertainty = $\frac{0.005\text{mm}}{60.00\text{mm}} \times 100$ = 8.33×10^{-3} %	**2**
1(b)(i)	• Calculates mean for minimum 3 values for width and length	**(1)**	<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	
	• Mean width = 210.24 (mm) **and** Mean length = 297.03 (mm)	**(1)**		
	• Mean values given to 0.01 mm with correct unit	**(1)**		**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. Example of calculation $\rho = \frac{2070\ \text{g}}{(21.024 \times 6.000 \times 29.703)\text{cm}} = 0.5525$ (g cm^{-3})	**2**
1(b)(iii)	• Zero error in (the reading from) the balance	**(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)**		**1**
2(a)(ii)	• Loud sound could damage hearing/ears **(1)** • 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 **(1)**	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 **(1)** • Calculates mean from minimum of 3 gaps **(1)** • $w = 0.62$ m **(1)**	<u>Example of calculation</u> Total distance = 3.33 − 0.22 = 3.11 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 $w = \lambda D / s$ **(1)** • Correct value of λ given to nearest cm with correct unit e.c.f. 2(b)(i) **(1)**	<u>Example of calculation</u> $\lambda = \frac{sw}{D} = \frac{1.10\text{m}\times 0.62\text{m}}{4.0\text{m}} = 0.1705 = 0.17$ m	**2**
2(c)(i)	• (As $v = f\lambda$) the frequency would need to be measured **(1)** • States suitable apparatus to measure frequency **(1)**	Accept time period for frequency Accept frequency meter, oscilloscope/CRO, sound sensor with datalogger, mobile phone with an app	**2**

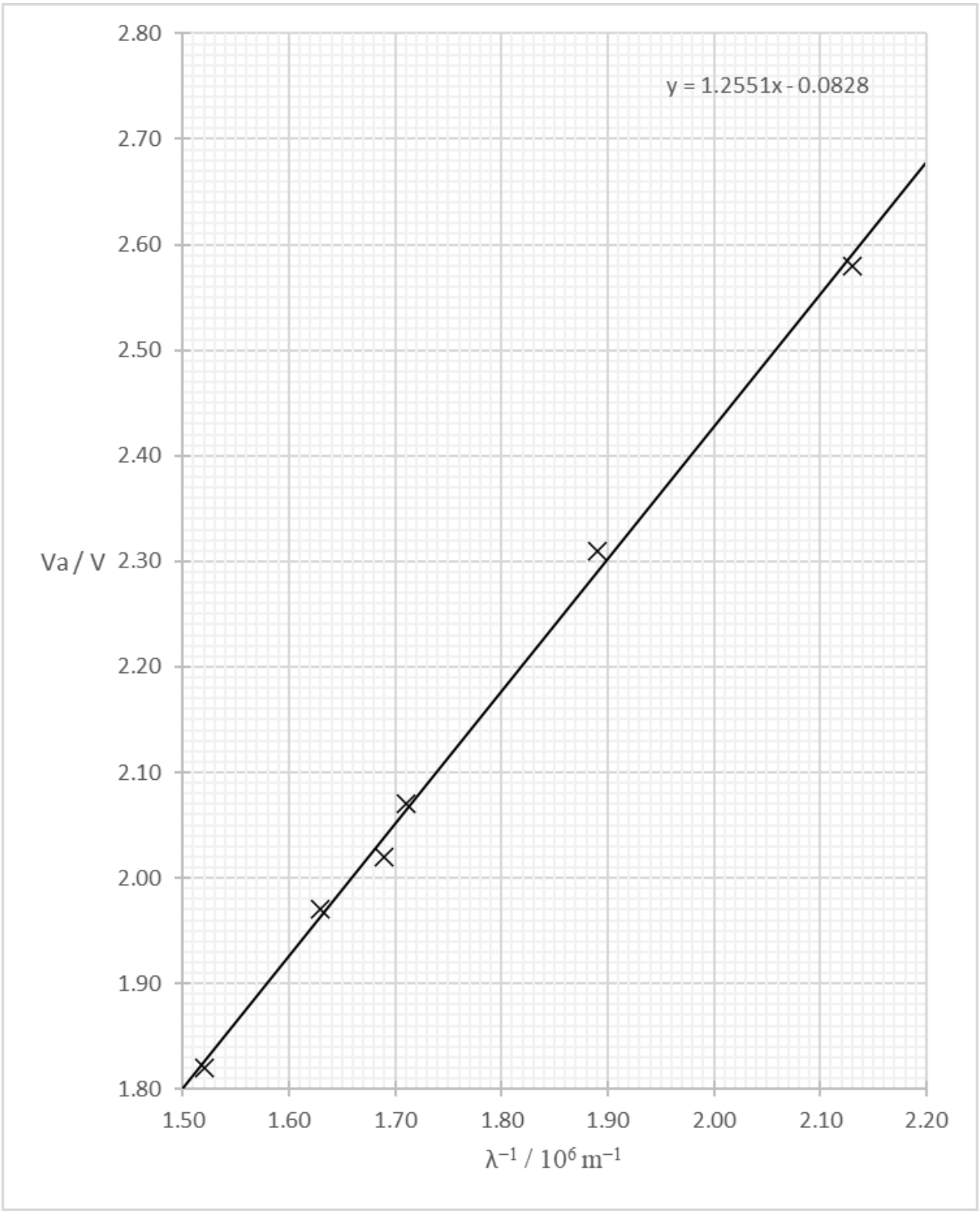
2(c)(ii)	**EITHER** • As $\lambda = v / f$, λ will increase **(1)** • As $w = \lambda D / s$, w will increase as f, D and s remain constant **(1)** MP2 dependent on MP1 **OR** • $w = v D / f s$ **(1)** • So w will increase as f, D and s remain constant **(1)** MP2 dependent on MP1	Allow max ONE mark 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 **(1)** • Ammeter in series with motor **and** voltmeter in parallel with motor only **(1)**	Example of circuit  	**2**
3(b)(i)	• Clamp/fix the metre rule in position **(1)** • Ensure the metre rule is vertical using a set square **Or** Ensure the metre rule is perpendicular to the floor using a set square **(1)** • 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 **(1)** • Take measurements perpendicular to the scale **Or** Use a set square to read off the scale **(1)**	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) random errors. **(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 **Or** power of lifting mass = Fv with $F=mg$ **and** $v=h/t$ **(1)** • So efficiency = power of lifting mass / power of lifting motor **Or** efficiency = $(mgh / t) / VI$ **(1)** **OR** • Energy transferred to motor = VIt **(1)** • Energy transferred to lifting mass = mgh **(1)** • So efficiency = energy transferred to lifting mass / energy transferred to motor **Or** efficiency = $(mgh) / (VIt)$ **(1)**	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**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>4(a)</td><td>• $V_a = \frac{hc}{e}\frac{1}{\lambda} + \frac{W}{e}$ (1)
• Compares to $y = mx + c$ with terms in correct order (1)
• Where the gradient = $\frac{hc}{e}$ which is constant
Or Where the gradient = $\frac{hc}{e}$ and h, c and e are all constants (1)
MP3 dependent on MP1</td><td>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.</td><td>3</td></tr>
<tr><td>4(b)(i)</td><td>• Correct values for $\frac{1}{\lambda}$ (1)
• Values given consistently to 3 s.f. (1)</td><td>Power of 10 in table must be correct.
<table><tr><th>λ / 10^{-7} m</th><th>V_a / V</th><th>$1/\lambda$ / 10^6 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></td><td>2</td></tr>
<tr><td>4(b)(ii)</td><td>• Axes labelled: y-axis as V_a / V and x-axis as $\frac{1}{\lambda}/10^6 m^{-1}$ (1)
Or Axes labelled: y-axis as V_a / V and x-axis as $\frac{1}{\lambda} \times 10^{-6}/m^{-1}$.</td><td>Accept power of 10 consistent with table. Do not accept reversed axes.</td><td></td></tr>
</table>

	• Sensible scales for both axes	**(1)**	Axes must cover at least half grid, value of small square in 1, 2 or 5 only	
	• Data plotted accurately	**(2)**	Plots within 1 mm	
	• Reasonable line of best fit drawn	**(1)**	Straight, plots on both sides of line, no rotation Accept graph in landscape	**5**


y = 1.2551x - 0.0828
Va / V
2.80
2.70
2.60
2.50
2.40
2.30
2.20
2.10
2.00
1.90
1.80
1.50
1.60
1.70
1.80
1.90
2.00
2.10
2.20
λ⁻¹ / 10⁶ m⁻¹

4(b)(iii)	• Uses large triangle **(1)** • Uses gradient $= \frac{hc}{e}$ **Or** Uses $V_a = \frac{hc}{e}\frac{1}{\lambda} + \frac{W}{e}$ as simultaneous equations **(1)** • h in range 6.45×10^{-34} to 6.89×10^{-34}, given to 2 or 3 s.f. with units J s **(1)**	Example of calculation gradient $= \frac{2.64-1.80}{(2.17-1.50)\times10^{6}} = 1.25\times10^{-6}$ $h = \frac{\text{gradient}\times e}{c} = \frac{1.25\times10^{-6}\times1.60\times10^{-19}\text{C}}{3.00\times10^{8}\text{ms}^{-1}}$ $= 6.67\times10^{-34}$ J s	**3**
4(b)(iv)	• Calculation of percentage difference with 6.63×10^{-34} J s as denominator **(1)** • Conclusion based on comparison of percentage difference **Or** Conclusion based on comparing calculated h with 6.63×10^{-34} J s **(1)**	Example of calculation $\%D = \frac{(6.67-6.63)\times10^{-34}\text{Js}}{6.63\times10^{-34}\text{Js}} \times 100 = 0.6\ \%$	**2**
		Total for question 4	**15**