Pearson Edexcel

Mark Scheme (Results)

Summer 2025

Pearson Edexcel International Advanced Subsidiary Level in Physics (WPH13)
Paper 01 Practical Skills in Physics I

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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.

Mark Scheme Notes:

This mark scheme is published to help teachers and candidates understand the exam requirements. Please note that the mark schemes can be better understood when viewed alongside the question paper and the Principal Examiner Report for Teachers.

It's important to emphasise that a mark scheme is a work in progress that can be further refined and expanded based on students' responses to a particular paper.

It is important to avoid making assumptions about future mark schemes based on a document from one year.

Although the guiding principles of assessment remain constant, the details may vary based on the content of a particular examination paper.

Using the Mark Scheme

Examiners should look for qualities to reward rather than faults to penalise. This does NOT mean giving credit for incorrect or inadequate answers, but it does mean allowing candidates to be rewarded for answers showing correct application of principles and knowledge. Examiners should therefore read carefully and consider every response: even if it is not what is expected it may be worthy of credit.

The mark scheme gives examiners:

- an idea of the types of response expected
- how individual marks are to be awarded
- the total mark for each question
- examples of responses that should NOT receive credit.

/ means that the responses are alternatives and either answer should receive full credit.

( ) means that a phrase/word is not essential for the award of the mark but helps the examiner to get the sense of the expected answer.

Phrases/words underlined indicate that the meaning of the phrase or the actual word is essential to the answer.

ecf/TE/cq (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

Candidates must make their meaning clear to the examiner to gain the mark. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct context.

Graphs

A mark given for axes requires both axes to be labelled with quantities and units and drawn the correct way round. Sometimes a separate mark will be given for units or for each axis if the units are complex. This will be indicated on the mark scheme.

A mark given for choosing a scale requires that the chosen scale allows all points to be plotted, spreads plotted points over more than half of each axis of the available space and is not an awkward scale e.g., multiples of 3, 7 etc.

For WPH13 there are two marks available for plotting data points. Points should be plotted to within 1 mm.

- If all are within 1 mm, award 2 marks.
- If one point is 1+ mm out, award 1 mark.
- If two or more points are 1+ mm out, award 0 marks.

For a line mark there must be a thin continuous line which is the best-fit line for the candidate's results.

Question Number	Answer		Additional Guidance	Mark
1(a)(i)	1 g	**(1)**	Answer must include a unit Accept 0.001 kg	**1**
1(a)(ii)	Use of percentage uncertainty = $\frac{\text{(half) resolution}}{\text{measurement}} \times 100$	**(1)**		**2**
	Percentage uncertainty = 0.4 (%) Accept 0.37 (%)	**(1)**	Allow ecf from 1(a)(i) for MP1 and correct calculation using half their resolution for MP2 For MP2 accept correct evaluation based on a conversion of 135 g to 0.135 kg if it is clear that 1(a)(i) is in kg (e.g. 0.001 or a value with the unit kg) <u>Example of calculation</u> Percentage uncertainty = $\frac{0.5\text{ g}}{135\text{ g}} \times 100 = 0.37$ %	
1(b)(i)	**EITHER** Check (and correct for) zero error	**(1)**		**2**
	To eliminate <u>systematic</u> error	**(1)**	MP2 must be linked to a relevant technique for measuring length	
	OR Repeat in different places and calculate a mean	**(1)**	Do not accept "repeat in different orientations".	
	To reduce (the effect of) <u>random</u> error	**(1)**	MP2 must be linked to a relevant technique for measuring length	
1(b)(ii)	**EITHER** Use Pythagoras' theorem to calculate the length of the other side of the triangle	**(1)**	e.g. $length = \sqrt{a^2 + b^2}$	**2**
	Measure the length of the other side of the triangle to check they are the same	**(1)**		
	OR Measure the length of the other side of the triangle	**(1)**		
	Use the cosine rule to calculate the angle (to check if it is 90˚)	**(1)**	e.g. $length = \sqrt{a^2 + b^2 - 2ab\,cos\theta}$ Do not accept "use sine rule", as the sine rule requires 2 angles.	

Question Number	Answer		Additional Guidance	Mark
1(b)(iii)	Calculates volume of prism	**(1)**		**3**
	Use of $\rho = \frac{m}{V}$	**(1)**	MP2 only – accept substitution of an incorrect volume (e.g. volume of cuboid)	
	Density = 8.65 (g cm^{-3}) **and** rounded to 3 sf [accept 8.64 (g cm^{-3})]	**(1)**	<u>Example of calculation</u> V = (½ *ab*) × *c* = ½ × 2.53 cm × 2.49 cm × 4.96 cm V = 15.6 cm^3 $\rho = \frac{m}{V} = \frac{135\text{ g}}{15.6\text{ cm}^3}$ = 8.65 g cm^{-3}	
1(b)(iv)	**EITHER** Correct value of the relevant limit of 0.9% uncertainty range	**(1)**	Allow e.c.f. form 1(b)(iii)	**2**
	Conclusion based on comparison of this limit with 8.94 g cm^{-3} MP2 dependent on MP1	**(1)**	For MP2 – a comparison must be given/stated <u>Example of calculation</u> Upper limit = 8.65 g cm^{-3} × (1 + 0.009) = 8.73 g cm^{-3} As the upper limit is below 8.94 g cm^{-3} the prism is not made of copper	
	OR Correct value of percentage difference	**(1)**	Allow e.c.f. form 1(b)(iii)	
	Conclusion based on comparison of this percentage difference with 0.9% MP2 dependent on MP1	**(1)**	For MP2 – a comparison must be given/stated <u>Example of calculation</u> Percentage difference = $\frac{(8.94 - 8.65)\text{ g cm}^{-3}}{8.94\text{ g cm}^{-3}} \times 100 = 3.2\%$ As the percentage difference is greater than 0.9% the prism is not made of copper	

(Total for Question 1 = 12 marks)

Question Number	Answer		Additional Guidance	Mark
2(a)	**Max THREE from** Clamp the metre rule in position **Or** ensure the metre rule is close to the track	**(1)**		
	Ensure the metre rule is horizontal using a spirit level **Or** ensure the metre rule is horizontal using a set square against the vertical stand	**(1)**	MP2 Ignore reference to "ensure metre rule is vertical using a set square". If plumb lines are used, accept the metre rule on the bench as an alternate description	
	Ensure the zero on the metre rule is at the rest/start position	**(1)**		
	Use set square (at rest/start positions) to read the scale on the metre rule **Or** use plumb line (at rest/start positions) to read the scale on the metre rule	**(1)**	MP4 Ignore reference to "measure by looking perpendicular to the metre rule scale". Ignore reference to "drawing marks on the track" Accept alternative to plumb lines (e.g. additional vertical stands lined up with the rest and start positions)	**3**
2(b)(i)	Calculation of mean	**(1)**	<u>Example of calculation</u> Mean value of $n = \frac{(5.23 + 5.89 + 5.66 + 5.01)\ \text{s}}{4} = 5.45\ \text{s}$	
	Mean t = 5.45 s **and** rounded to 3 sf	**(1)**		**2**
2(b)(ii)	Calculates half range for uncertainty	**(1)**	Accept uncertainty = difference between the mean and the furthest value from the mean	
	Percentage uncertainty = 8 (%) [accept 8.1 (%)]	**(1)**	Allow e.c.f. form 2(b)(i) <u>Example of calculation</u> Uncertainty = half range $= \frac{(5.89 - 5.01)\ \text{s}}{2} = 0.44\ \text{s}$ Percentage uncertainty $= \frac{0.44\ \text{s}}{5.45\ \text{s}} \times 100 = 8.07\%$	**2**
2(c)	Inconsistent decimal places (for d) **Or** inconsistent significant figures (for mean t)	**(1)**		
	There are not enough points to draw a reliable graph **Or** repeat measurements for time not shown (for all values of d)	**(1)**	MP2 – accept alternative wording (e.g. "only 4 sets of data", "not enough data") Accept "no repeats shown". Do not accept "No evidence of repeats" as there is evidence seen in 2(b)	
	Final value of t at 17 cm should be 8.2 s	**(1)**		**3**

Question Number	Answer	Additional Guidance	Mark
2(d)	A video recording could be slowed down to see when the sphere stops moving **(1)** So, the time will be more accurate **Or** avoiding error due to reaction time **(1)** MP2 dependent on MP1	Accept idea of viewing footage "frame by frame"	**2**

(Total for Question 2 = 12 marks)

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	This ensures the current will be at the minimum/smallest **(1)** To prevent the risk of overheating **Or** to prevent a short circuit **Or** to avoid damaging the components **(1)**	"Smaller", "less" or "lower" current is too vague, the question states maximum resistance and "limits current" is insufficient For components allow ammeter, power supply or variable resistor Ignore "damages the circuit". Accept reverse argument (e.g. minimum resistance would give the largest/maximum current, which would damage the ammeter)	**2**
3(a)(ii)	**EITHER** There will be little/no variation in the current and potential difference for repeat readings (at same resistance) **Or** random error would be small/negligible **(1)** So repeat readings are not appropriate **(1)** MP2 dependent on MP1 **OR** Changes in temperature will vary the (resistance/current/p.d.) readings **Or** changes in temperature will cause random errors **Or** (analogue) ammeter/voltmeter may cause a parallax error **Or** repeat readings can be used to identify anomalous data **(1)** So repeat readings are appropriate **(1)** MP2 dependent on MP1	Ignore references to the ohmmeter Ignore systematic error Do not accept answers including a systematic error for this version	**2**

Question Number	Answer		Additional Guidance	Mark
3(b)(i)	Value between 1.5 Ω and 1.6 Ω	**(1)**		**1**
3(b)(ii)	Use of $P = \frac{V^2}{R}$	**(1)**	Accept substitution of a power value from the graph (2 to 6W) and their resistance from 3(b)(i) for MP1 Accept use of $P = I^2R$ **and** $V = IR$ for MP1	
	Potential difference = 3 V	**(1)**	Allow e.c.f. from 3(b)(i) with P = 5.6 Wfor MP2 <u>Example of calculation</u> $P = \frac{V^2}{R}$ $V = \sqrt{PR} = \sqrt{5.6\ \text{W} \times 1.6\ \Omega}$ = 2.99 V	**2**
3(c)	<u>Advantage</u> (Maximum power) would produce the maximum signal strength **Or** (Maximum power) would produce signals which can travel further	**(1)**	Accept "maximum intensity" for maximum signal strength Ignore "transmits over a larger area" if not linked to larger distance	
	<u>Disadvantage</u> (50% of the) energy will be dissipated from the circuit, so more input power is needed **Or** (50% of the) energy will be dissipated from the circuit, so the circuit/transmitter/surroundings would heat up	**(1)**	Idea that something is "heating up" is sufficient for MP2, but "energy is wasted" is insufficient.	**2**

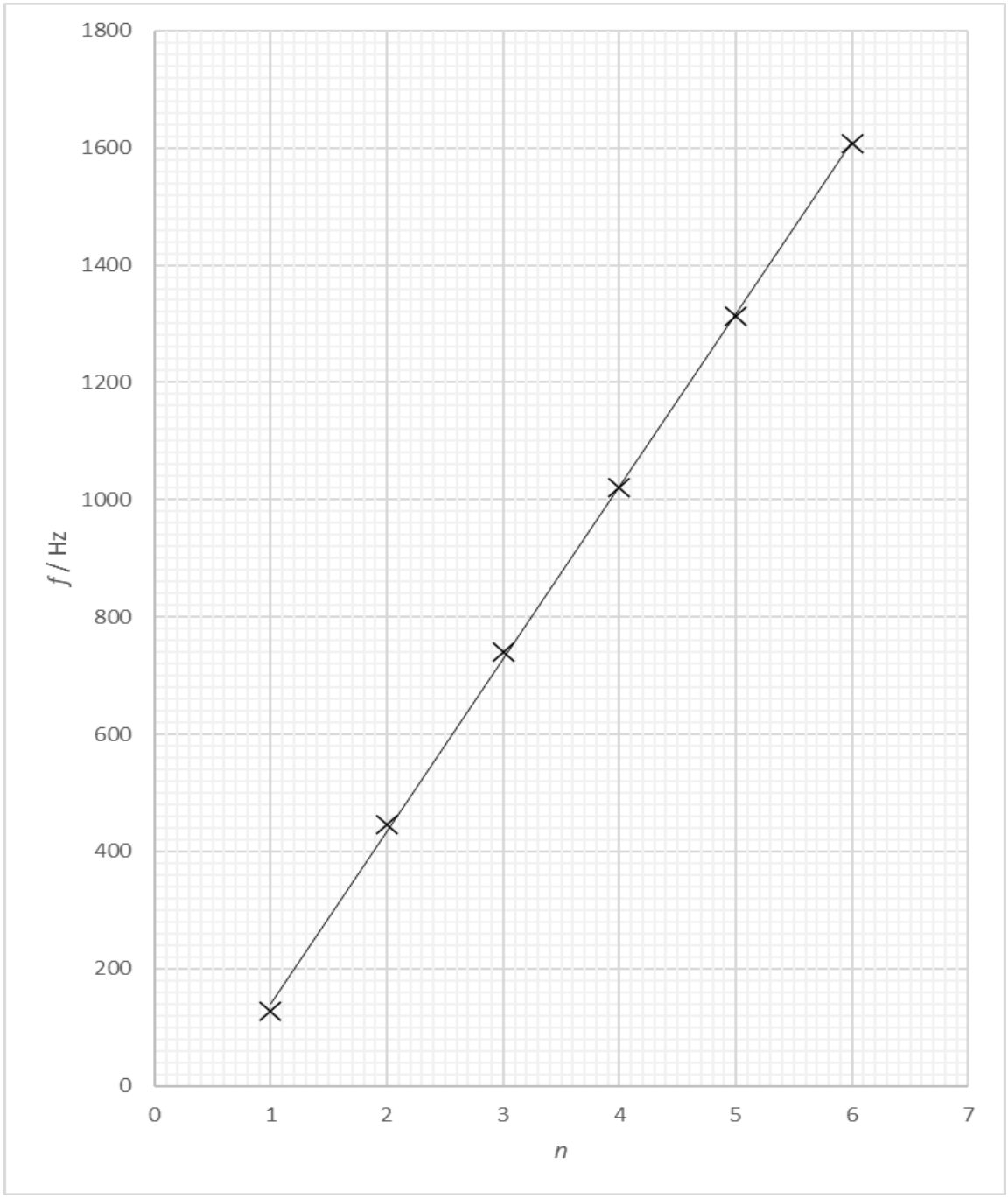
(Total for Question 3 = 9 marks)

Question Number	Answer		Additional Guidance	Mark
4(a)	**EITHER** Use a set square between the cylinder and metre rule to read off the scale **Or** take readings perpendicular to the metre rule **Or** move the metre rule close to the cylinder	**(1)**	Accept "take readings horizontally" or "take readings at eye-level"	**2**
	(To reduce) <u>parallax</u> error in reading *L* MP2 dependent on MP1	**(1)**	Reducing "random error" is insufficient	
	OR Use a set square to ensure metre rule is perpendicular to the table	**(1)**	Accept other valid methods to ensure metre rule is vertical (e.g. spirit level, plumb line)	
	(To reduce) <u>systematic</u> error in *L* MP2 dependent on MP1	**(1)**	Do not accept "parallax error" in this version	
4(b)	**EITHER** Slowly increase **and** decrease the frequency, and record the frequency (of the loudest sound heard) in both directions	**(1)**	"Increase frequency slowly" is not sufficient, as this is given in the question.	**2**
	Calculate the mean of these frequencies	**(1)**	MP2 must be linked to a relevant technique for measuring frequency	
	OR Use a microphone and a CRO	**(1)**		
	(The standing wave will be produced) at maximum amplitude on the CRO	**(1)**	MP2 must be linked to a relevant technique for viewing amplitude	
	OR Use a sound level meter	**(1)**		
	(The standing wave will be produced) at maximum value on the screen	**(1)**	MP2 must be linked to a relevant technique for measuring sound level. Ignore "loudest" "strongest" sound, as this is given in the question. We are looking for some description of a measurement.	
4(c)(i)	$f = \left(\frac{v}{2L}\right)n + k$ compares to $y = mx + c$	**(1)**	There must be some link between *m* and the gradient	**2**
	So $v = 2L \times gradient$	**(1)**	Accept $\frac{v}{2L}$ is the gradient	

Question Number	Answer		Additional Guidance	Mark
4(c)(ii)	*y*-axis labelled as *f* / Hz **and** *x*-axis labelled as *n* with no unit Sensible scales Plotting Line of best fit	**(1)** **(1)** **(2)** **(1)**	MP1 – labels in standard format "quantity / unit" If axes are reversed, MP2 to 4 can still be awarded MP2 – Scale increments in powers of 10 of "1, 2, 5" on the 2 cm (and 2 mm) lines and plots cover at least half of the paper. MP3 – Plots accurate to ½ square (1 mm) on a sensible scale – all correct = 2 marks, only 1 error = 1 mark, 2+ errors = 0 marks MP4 – a single straight line that follows the trend and is balanced	**5**
4(c)(iii)	Calculates gradient using large triangle Uses gradient = $\frac{v}{2L}$ *v* between 338 and 354 *v* given to 2 or 3 s.f, with unit	**(1)** **(1)** **(1)** **(1)**	Over half the range of plots used in gradient calculation Data used should come from the line of best fit If table data used, check those points are on the line of best fit <u>Example of calculation</u> Gradient = $\frac{1360-140}{5.2-1.0} = \frac{1220}{4.2}$ = 290.5 *v* = gradient × 2*L* = 291 × 2 × 0.595 = 346 m s^{-1}	**4**
4(c)(iv)	**EITHER** Correct *y*-intercept read from graph **Or** Calculation of *k* using gradient/velocity and a data point Conclusion consistent with comparing the magnitude of 2*k* with gradient **Or** Conclusion consistent with comparing the magnitude of *k* with ½ gradient **OR** Calculation of *v* using *k* = ½ × gradient and a data point Conclusion consistent with comparing the calculated *v* for both positive and negative *k* with answer from 4(c)(iii)	**(1)** **(1)** **(1)** **(1)**	MP2 must include a comparison between the values They must be comparing the magnitude of *k* (so not a negative value) <u>Example of calculation</u> *y*-intercept = 1360 – 291 × 5.2 = – 153 2*k* = 2 × 153 = 306 2*k* is much greater than the gradient, so the suggestion is incorrect	**2**

(Total for Question 4 = 17 marks)

n	f / Hz
1	128
2	445
3	741
4	1020
5	1312
6	1608



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