Pearson

Mark Scheme (Results)

Summer 2026

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.

Mark scheme notes

Underlying principle

The mark scheme will clearly indicate the concept that is being rewarded, backed up by examples. **It is not a set of model answers.**

1. Mark scheme format

1.1 You will not see 'wtte' (words to that effect). Alternative correct wording should be credited in every answer unless the MS has specified specific words that must be present. Such words will be indicated by underlining e.g. 'resonance'

1.2 Bold lower case will be used for emphasis e.g. '**and**' when two pieces of information are needed for 1 mark.

1.3 Round brackets ( ) indicate words that are not essential e.g. "(hence) distance is increased".

1.4 Square brackets [ ] indicate advice to examiners or examples e.g. [Do not accept gravity] [ecf].

2. Unit error penalties

2.1 A separate mark is not usually given for a unit but a missing or incorrect unit will normally mean that the final calculation mark will not be awarded.

2.2 This does not apply in 'show that' questions or in any other question where the units to be used have been given, for example in a spreadsheet.

2.3 The mark will not be awarded for the same missing or incorrect unit only once within one clip in epen.

2.4 Occasionally, it may be decided not to insist on a unit e.g the candidate may be calculating the gradient of a graph, resulting in a unit that is not one that should be known and is complex.

2.5 The mark scheme will indicate if no unit error is to be applied by placing brackets around the unit.

3. Significant figures

3.1 Use of too many significant figures in the theory questions will not prevent a mark being awarded if the answer given rounds to the answer in the MS.

3.2 Too few significant figures will mean that the final mark cannot be awarded in 'show that' questions where one more significant figure than the value in the question is needed for the candidate to demonstrate the validity of the given answer.

3.3 The use of one significant figure might be inappropriate in the context of the question e.g. reading a value off a graph. If this is the case, there will be a clear indication in the MS.

3.4 The use of g = 10 m s^{-2} or 10 N kg^{-1} instead of 9.81 m s^{-2} or 9.81 N kg^{-1} will be penalised by one mark (but not more than once per clip). Accept 9.8 m s^{-2} or 9.8 N kg^{-1}

3.5 In questions assessing practical skills, a specific number of significant figures will be required e.g. determining a constant from the gradient of a graph or in uncertainty calculations. The MS will clearly identify the number of significant figures required.

4. Calculations

4.1 **use of** the formula means that the candidate demonstrates substitution of physically correct values, although there may be conversion errors e.g. power of 10 error.

4.2 If a 'show that' question is worth 2 marks, then both marks will be available for a reverse working. If the question is worth 3 marks then only 2 marks will be available.

4.3 The mark scheme will show a correctly worked answer for illustration only.

5. Graphs

5.1 A mark given for axes requires both axes to be labelled with quantities and units, and drawn the correct way round.

5.2 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.

5.3 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 and is not an awkward scale e.g. multiples of 3, 7 etc.

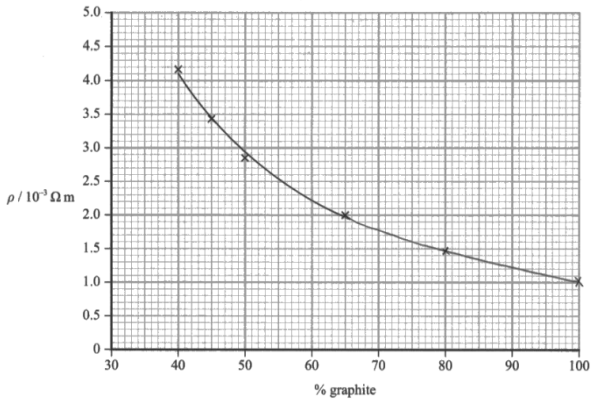
5.4 Points should be plotted to within 1 mm. For WPH13 there are two marks for plotting.

5.5 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)	• (on breaking, rubber strip might) hit the student in the eye • wear eye protection	**(1)** **(1)**	Accept idea of damaging/hurting the eye Accept goggles, safety spectacles, safety glasses Do not accept glasses, spectacles Max one mark for rubber band hitting face/hands if no other marks awarded.	**2**
1(b)(i)	• 1 N	**(1)**	Accept Newton/newton/n for N	**1**
1(b)(ii)	• Uses (half) resolution • %U = 2% given to 1 or 2 s.f ecf b(i)	**(1)** **(1)**	<u>Example calculation</u> $\%U = \frac{0.5\ \text{N}}{21\ \text{N}} \times 100 = 2.4\ \%$	**2**
1(c)(i)	• Data is recorded to inconsistent decimal places **Or** Not possible to measure *F* to 0.5 N • There is not enough data (to plot a graph) **Or** No evidence of repeat readings	**(1)** **(1)**	Ignore references to intervals, units and anomalies Accept 'Only 4 data sets'	**2**
1(c)(ii)	• Use of $\sigma = \frac{F}{A}$ • $\sigma = 2.4 \times 10^6$ N m^{-2}	**(1)** **(1)**	<u>Example calculation</u> $\sigma = \frac{12\ \text{N}}{(0.5 \times 10^{-2}\text{m}) \times (1.0 \times 10^{-3}\text{m})}$ = 2 400 000 N m^{-2}	**2**
	Total for question 1			**9**

Question Number	Answer	Additional Guidance	Mark
2(a)	**EITHER** • Reduce the height/slope of the ramp **(1)** • To reduce the percentage uncertainty in the time measurement **(1)** MP2 dependent on MP1 **OR** • Mark the initial position of the trolley **(1)** • To ensure the trolley travels the same distance for each repeat **(1)** MP2 dependent on MP1 **OR** • Place a marker at the end of the ramp **(1)** • To reduce the uncertainty in the time measurement **(1)** MP2 dependent on MP1	Accept: • The student who releases the trolley should also operate the stopwatch • To reduce (the effect of) reaction time MP2 dependent on MP1	**2**
2(b)(i)	• Calculates mean using all four values of t **(1)** • Mean t = 0.31 s given to 2 d.p. **(1)**	<u>Example calculation</u> $t = \frac{(0.30 + 0.28 + 0.33 + 0.34)\text{s}}{4} = 0.3125\ \text{s}$	**2**
2(b)(ii)	• Uses half range **Or** uses furthest from mean **(1)** • %U = 10 % given to 1 or 2 s.f. e.c.f. 2(b)(i) **(1)**	<u>Example calculation</u> Half range = $\frac{(0.34-0.28)\text{s}}{2} = 0.03$ s $\%\text{U} = \frac{0.03\text{s}}{0.31\text{s}} \times 100 = 9.7\%$	**2**
2(b)(iii)	• (Position and time) readings are taken simultaneously **(1)** • Reduces error caused by starting/stopping the stopwatch **(1)**	Accept reference to reducing/eliminating reaction time	**2**
	Total for question 2		**8**

Question Number	Answer	Additional Guidance	Mark
3(a)	**EITHER** • Check (and correct) for zero error (on the micrometer) **(1)** • To reduce/eliminate <u>systematic error</u> **(1)** MP2 dependent on MP1	Max one mark for 'Avoid overtightening the micrometer' if no other marks awarded	**2**
3(b)(i)	• Use of $R = \frac{V}{I}$ **(1)** • R = 109 (Ω) **(1)**	<u>Example of calculation</u> $R = \frac{5.94\ \text{V}}{54.3 \times 10^{-3}\ \text{A}} = 109.4\ \Omega$	**2**
3(b)(ii)	• Calculates cross-sectional area of lead using $\frac{\pi d^2}{4}$ (**or** πr^2) **(1)** • Use of $\rho = \frac{RA}{l}$ **(1)** • $\rho = 1.47 \times 10^{-3}$ (Ω m) given to minimum 3 s.f. **(1)**	<u>Example of calculation</u> $A = \frac{\pi}{4}d^2 = \frac{\pi}{4}(2.0 \times 10^{-3}\text{m})^2 = 3.14 \times 10^{-6}\ \text{m}^2$ $\rho = \frac{56\Omega \times 3.14 \times 10^{-6}\ \text{m}^2}{0.120\text{m}} = 1.47 \times 10^{-3}\ (\Omega\ \text{m})$	**3**

3(b)(iii)	• (Plots point at (80, 1.5) and) extrapolates best-fit line to 100% • Value of resistivity consistent with best-fit line with unit	**(1)** **(1)**	Example of graph  	**2**
3(b)(iv)	• Uses constant = % graphite × resistivity • Uses (minimum) two pairs of values from the line of best fit • Conclusion consistent with comparison of calculated constants	**(1)** **(1)** **(1)**	Example calculation 40 ($\times 10^{-3}$ Ω m) × 4.1(%) = 164 ($\times 10^{-3}$ Ω m) 60 ($\times 10^{-3}$ Ω m) × 2.2 (%) = 132 ($\times 10^{-3}$ Ω m) As 164 does not equal 132, the student is incorrect	**3**
3(c)	**EITHER** • The circuit current increases • There is internal resistance (in the power supply) • (So) the p.d. across the internal resistance increases **OR** • There is internal resistance (in the power supply) • (So) the pencil lead resistance becomes a smaller proportion of the total circuit resistance **Or** the ratio of pencil lead resistance to internal resistance decreases	**(1)** **(1)** **(1)** **(1)** **(1)** **(1)**	Accept "lost volts" increases. Accept 'terminal p.d. decreases' Allow converse Accept 'proportion of circuit p.d./total p.d./e.m.f.	**3**

	• (So) the p.d. across the internal resistance increases	across pencil lead decreases', Accept "lost volts" increases. Accept 'terminal p.d. decreases'.	
	Total for question 3		**15**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>4(a)(i)</td><td>• Use a spirit level (1)</td><td>Accept ‘use a set square’</td><td>1</td></tr>
<tr><td>4(a)(ii)</td><td>• Clamp a metre rule close to the tube
Or Clamp a metre rule so it is vertical (1)

• View the scale perpendicularly
Or Video the motion and view in slow motion (1)</td><td></td><td>2</td></tr>
<tr><td>4(b)(i)</td><td>• $h = \frac{k}{2mg} \times x^2$ is in the form $y = mx\ (+ c)$ (1)
• where the gradient is $\frac{k}{2\,mg}$ (1)</td><td></td><td>2</td></tr>
<tr><td>4(b)(ii)</td><td>• All values correct (1)
• All values given to 2 s.f. (1)

[Accept 12 or 12.3 for final data value only]</td><td><table><tr><th>x / cm</th><th>h / m</th><th>x^2 / cm^2</th></tr><tr><td>1.0</td><td>0.20</td><td>1.0</td></tr><tr><td>1.5</td><td>0.35</td><td>2.3</td></tr><tr><td>2.0</td><td>0.67</td><td>4.0</td></tr><tr><td>2.5</td><td>1.09</td><td>6.3</td></tr><tr><td>3.0</td><td>1.55</td><td>9.0</td></tr><tr><td>3.5</td><td>1.96</td><td>12.3</td></tr></table></td><td>2</td></tr>
<tr><td>4(b)(iii)</td><td>• Axes labelled: y as h / m, x as x^2 / cm^2 Or x^2 / 10^{-4} m^2 (1)

• Sensible scales chosen for both axes (1)

• Processed data plotted accurately (2)</td><td>Do not accept reversed axes or titles as quantity (unit).

Axes must cover at least half grid, value of small square in 1, 2 or 5 only

Plots within 1 mm</td><td></td></tr>
</table>

	• Reasonable best fit line drawn **(1)**	Straight, plots on both sides of line, no rotation Accept graph in landscape	**5**
4(b)(iv)	• Uses large triangle (to calculate gradient) **(1)** • Uses gradient = $\frac{k}{2\,mg}$ **(1)** • Value of k in range 461 (N m^{-1}) to 519 (N m^{-1}) **(1)** • Value of k given to 2 or 3 s.f. with correct unit **(1)**	Example of calculation gradient = $\frac{1.94-0.04}{(11.8-0)\times10^{-4}} = \frac{1.90}{11.8\times10^{-4}}$ = 1610 (m^{-1}) k = 2mg × gradient = 2 × 0.015 kg × 9.81 N kg^{-1} × 1610 m^{-1} = 474 N m^{-1}	**4**
4(b)(v)	**EITHER** • Calculates relevant limit using calculated value of k and 5% **(1)** • Conclusion consistent with comparison of calculated limit with k = 490 N m^{-1} **(1)** **OR** • Calculates %D **(1)** • Conclusion consistent with comparison of calculated %D with 5 % **(1)**	Example of calculation Upper limit = 477 N m^{-1} × (1 + 0.05) = 501 N m^{-1} As this is more than 490 N m^{-1} then the student's value agrees with the manufacturer's value **Uses 5% on manufacturer's value scores 0** Example of calculation %D = $\frac{(490-477)\text{Nm}^{-1}}{490\text{Nm}^{-1}} \times 100$ = 2.7 % As this is less than 5% the student's value of k agrees with the manufacturer's value	**2**
	Total for question 4		**18**