Pearson Edexcel

Mark Scheme (Results)

October 2024

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

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October 2024
Question Paper Log Number P78397A
Publications Code WPH13_01_2410_MS
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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.

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.

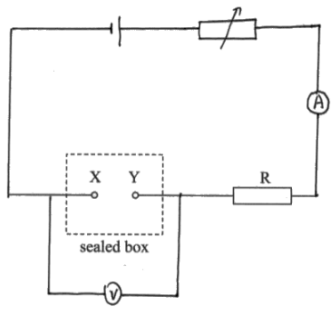
A mark given for choosing a scale requires that the chosen scale allows all points to be plotted, spreads plotted points over more than half of each axis of the available space and is not an awkward scale e.g., multiples of 3, 7 etc.

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

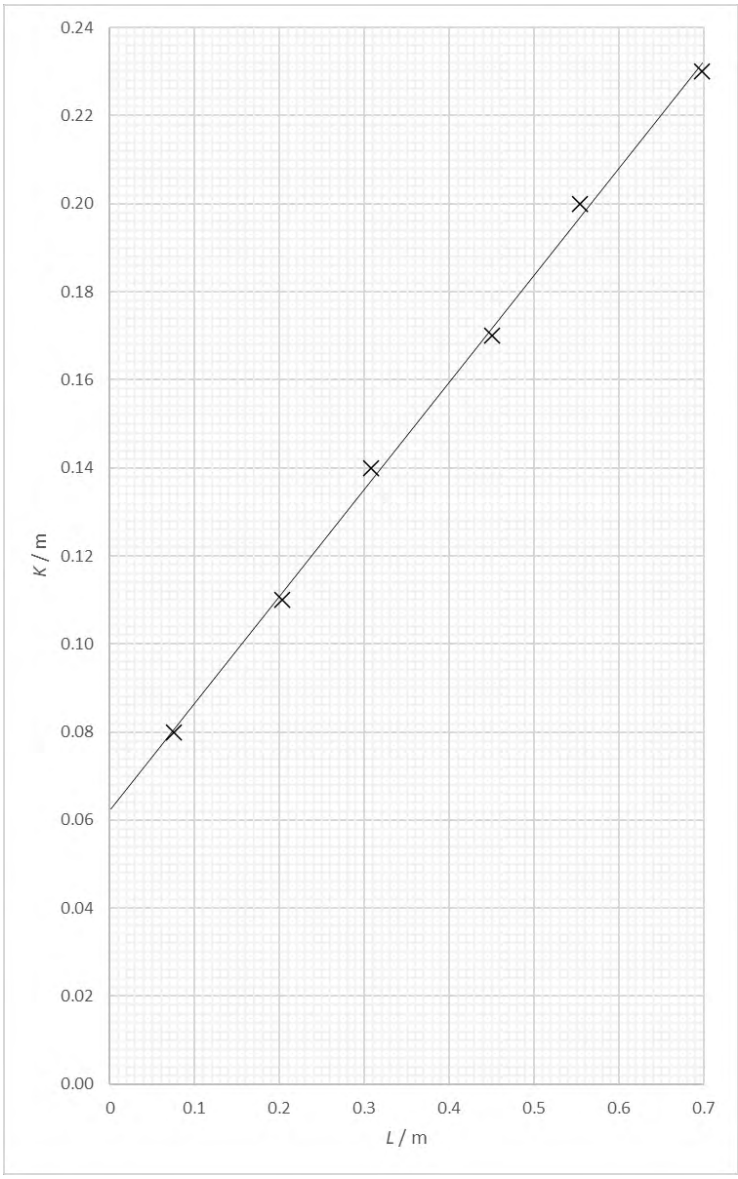
- If all are within 1 mm, award 2 marks.
- If one point is 1+ mm out, award 1 mark.
- If two or more points are 1+ mm out, award 0 marks.

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		Mark
1(a)(i)	Uses percentage uncertainty = half resolution / measurement (× 100%) Percentage uncertainty = 0.4% Accept 0.39%, 0.394% Example of calculation Percentage uncertainty = $\frac{0.05\text{ mm}}{12.7\text{ mm}} \times 100 = 0.394\%$	**(1)** **(1)**	**2**
1(a)(ii)	Check (and correct for) zero error To eliminate systematic error MP2 dependent on MP1	**(1)** **(1)**	**2**
1(a)(iii)	Use a (mass) balance to obtain the mass Divide d by two (to obtain the radius) and calculate the volume using $\frac{4}{3}\pi r^3$ Calculate density using $\rho = \frac{m}{V}$	**(1)** **(1)** **(1)**	**3**
1(b)	Use a metre rule to measure distance (travelled by the sphere) Record distance **Or** time for two regions between the rubber bands Start and stop the stopwatch when the same point of the steel sphere passes the band **Or** Ensure measurement (of time) is taken in line with the sphere **Or** Use the lap timer on stopwatch **Or** Repeat with the sphere at the same initial position **Or** Record the motion between the rubber bands **and** view in slow motion Relate measurements to terminal velocity, e.g. travels equal distance in equal time, or velocity is equal in each region	**(1)** **(1)** **(1)** **(1)**	**4**
1(c)	**EITHER** Lower limit = 0.68 (Pa s) Correct conclusion comparing calculated lower limit to quoted viscosity of castor oil Example of calculation Lower limit = 0.72 Pa s × (1 − 0.06) = 0.68 (Pa s) The lower limit is greater than 0.65 (Pa s) so the liquid is not castor oil **OR** Percentage difference = 11% [Accept 10%] Correct conclusion comparing calculated %D to 6%	**(1)** **(1)** **(1)** **(1)**	**2**
	Total for question 1		**13**

Question Number	Answer		Mark
2(a)(i)	Circuit containing power supply, voltmeter, ammeter, variable resistor Ammeter in series, voltmeter in parallel with sealed box Example of circuit  	**(1)** **(1)**	**2**
2(a)(ii)	The fixed resistor is needed to limit the (maximum) current in the circuit **Or** The fixed resistor is needed to prevent a short circuit Because when the direction of current/potential difference is reversed The diode has a low resistance (and the current in the circuit will be very high)	**(1)** **(1)** **(1)**	**3**
2(a)(iii)	Use of $R = \frac{V}{I}$ $R = 27\ \Omega$ **Or** $I = 0.161$ A **or** 0.294 A Use of $P = \frac{V^2}{R}$ **Or** Use of $P = I^2R$ **Or** Use of $P = V \times I$ Conclusion stating resistor D with comparisons to minimum resistance of 27 Ω and correct value calculated from a power formula **Or** Conclusion stating resistor D with comparisons to $I = 0.161$ A **or** 0.294 A and correct value calculated from a power formula Example of calculation $R = \frac{V}{I} = \frac{(6 - 0.7)\ \text{V}}{200 \times 10^{-3}\ \text{A}} = 27\ \Omega$ $P = \frac{V^2}{R} = \frac{(5.3\text{V})^2}{33\ \Omega} = 0.85$ W	**(1)** **(1)** **(1)** **(1)**	**4**
2(b)	The graph shows current readings when the potential difference is negative Therefore the resistor and diode are in parallel MP2 dependent on MP1	**(1)** **(1)**	**2**
	Total for question 2		**11**

Question Number	Answer		Mark
3(a)	Clamp the metre rule in position **Or** Ensure the metre rule is vertical using a set square	**(1)**	
	Place metre rule is close to the beaker	**(1)**	
	Use a set square to judge scale reading **Or** Read perpendicular to the scale	**(1)**	**3**
3(b)	Any **THREE** from:		
	The values are not recorded to consistent decimal places	**(1)**	
	No evidence of repeat readings	**(1)**	
	Four data points is not enough (to plot a reliable graph)	**(1)**	
	Final value of h_2 should be 45.1 **Or** Final value of h_2 does not fit the trend	**(1)**	**3**
	Ignore references to intervals and range		
3(c)(i)	Calculation of mean	**(1)**	
	Mean n = 1.35 2 d.p. only, no unit	**(1)**	**2**
	<u>Example of calculation</u> Mean value of $n = \frac{(1.38 + 1.41 + 1.33 + 1.29)}{4} = 1.353$		
3(c)(ii)	Uses half range for uncertainty Accept furthest from the mean	**(1)**	
	Percentage uncertainty = 4% e.c.f. 3(c)(i)	**(1)**	**2**
	<u>Example of calculation</u> Uncertainty = half range $= \frac{1.41 - 1.29}{2} = 0.06$ Percentage uncertainty $= \frac{0.06}{1.35} \times 100 = 4.44\%$		
	Total for question 3		**10**

Question Number	Answer		Mark
4(a)	$K = \left(\frac{M_B}{M_A}\right) L + \frac{0.2M_R}{M_A}$ compares to $y = mx + c$ **and** $\frac{0.2M_R}{M_A}$ is the y-intercept	**(1)**	
	So $M_R = \frac{y\text{−intercept} \times M_A}{0.2}$		
	Or So $M_R = 5 \times y$-intercept $\times M_A$	**(1)**	**2**
4(b)(i)	Axis labels: y as K / m and x as L / m	**(1)**	
	Sensible scales	**(1)**	
	Accurate plotting	**(2)**	
	Line of best fit	**(1)**	**5**
			

4(b)(ii)	Calculates gradient using large triangle **(1)** Gradient in range 0.237 to 0.249 **(1)** Calculated gradient given to 2 or 3 s.f, positive, no unit **(1)** <u>Example of calculation</u> gradient = $\frac{0.220 - 0.086}{0.65 - 0.10} = 0.244$	**3**
4(b)(iii)	Uses gradient = $\frac{M_B}{M_A}$ **(1)** Correct value of M_B given to the nearest gram e.c.f. (b)(ii) **(1)** <u>Example of calculation</u> M_B = gradient × M_A = 0.244 × 0.400 kg = 0.097 kg	**2**
4(b)(iv)	Correct *y*-intercept determined from graph **Or** Correct *y*-intercept determined using gradient and data point from best fit line **(1)** Uses *y*-intercept = $\frac{0.2M_R}{M_A}$ **(1)** Correct value of M_R e.c.f. 4(b)(ii) **(1)** Value of M_R given to the nearest gram with correct unit **(1)** <u>Example of calculation</u> *y*-intercept = 0.062 $M_R = \frac{y\text{−intercept} \times M_A}{0.2} = \frac{0.062 \times 0.400\ \text{kg}}{0.2} = 0.124$ kg	**4**
	Total for question 4	**16**

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