

Cambridge International AS & A Level

PHYSICS

9702/33

Paper 3 Advanced Practical Skills 1

October/November 2025

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2025 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

This document consists of **11** printed pages.









Annotations guidance for centres

Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the supervising examiners when they are checking the work of examiners within their team. The meaning of annotations and how they are used is specific to each component and is understood by all examiners who mark the component.

We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

The annotations listed below were available to examiners marking this component in this series.

Annotations

Annotation	Meaning
	arithmetic error
AWK	awkward scale used on graph
	benefit of the doubt given
	contradiction in response, mark not awarded
	correct point or mark awarded
	error carried forward applied
FO	false origin used on graph
	incorrect point or mark not awarded
	information missing or insufficient for credit
	power of ten error

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Annotation	Meaning
RO	read-off from graph
SH	supervisor's help given
SR	supervisor's report taken into account
SV	supervisor's value/sample results taken into account
TE	transcription error
IR	value in range
OOR	value out of range

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Question	Answer	Marks
1(a)	Value of S in the range 38.0 cm to 42.0 cm.	1
1(b)	Value of T in the range 1.0 s to 4.0 s.	1
	Repeats: At least two values of nT , time where $n \geq 2$.	1
1(c)	Six (or more) sets of readings of h (different values) and time, nT or T with the correct trend (as h increases \uparrow , T decreases \downarrow) scores 3 marks, five sets scores 2 marks etc.	3
	Range: at least one reading of $h \geq 33.0$ cm and at least one reading of $h \leq 15.0$ cm	1
	Column headings: Each column heading must contain a quantity and a unit where appropriate. The presentation of quantity and unit must conform to accepted scientific convention e.g. no unit for $\frac{S}{h}$ and T^2/s^2 or $T^2 (s^2)$	1
	Consistency: <u>All</u> values of raw h must be given to the nearest 0.1 cm.	1
	Significant figures: All values of $\frac{S}{h}$ must be given to the same s.f. as (or one more than) the least s.f. in raw h and S values.	1
	Calculation: Values of $\frac{S}{h}$ are correct.	1

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Question	Answer	Marks
1(d)(i)	<p>Axes: Axes must be labelled with the correct quantities.</p> <p>Scales must be chosen so that the plotted points occupy at least half the graph grid in both the x and y directions.</p> <p>Scale markings are no more than 2 cm (one large square) apart.</p> <p>Sensible scales must be used, no awkward scales (e.g. 3:10 or fractions).</p>	1
	<p>Plotting of points: All observations in the table must be plotted on the grid.</p> <p>Diameter of plotted points must be \leq half a small square.</p> <p>Points must be plotted to an accuracy of half a small square in both x and y directions.</p>	1
	<p>Quality: Trend of points must be positive. All points in the table must be plotted on the grid for this mark to be awarded.</p> <p>It must be possible to draw a straight line that is within 0.2 (to scale) on the $\frac{S}{h}$ axis (normally x-axis) of <u>all</u> plotted points.</p>	1
1(d)(ii)	<p>Line of best fit:</p> <p>'Best fit' is judged by the balance of all points on the grid (at least 5 points) about the candidate's line.</p> <p>There must be an even distribution of points either side of the line along the full length.</p> <p>Lines must not be kinked or thicker than half a square.</p> <p>Some candidates may choose to identify an anomalous point. If six or more points are plotted and they identify one point as anomalous (e.g. by circling or labelling) then this point is to be disregarded when judging the line of best fit. There must be at least 5 points left after the anomalous point is disregarded.</p>	1

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Question	Answer	Marks
1(d)(iii)	<p>Gradient: gradient sign on answer line consistent with graph drawn.</p> <p>The hypotenuse of the triangle used should be greater than half the length of the drawn line.</p> <p>Both read-offs must be accurate to half a small square in both the x and y directions.</p> <p>Method of calculation must be correct, not $\Delta x / \Delta y$.</p>	1
	<p>y-intercept:</p> <p>Either Intercept read directly from the graph, with read-off at $x = 0$, accurate to half a small square in y direction.</p> <p>Or Correct read-off from a point on the line is substituted into $y = mx + c$ or an equivalent expression.</p> <p>Read-off accurate to half a small square in both x and y directions.</p>	1
1(e)(i)	<p>Value of A = candidate's gradient value and value of B = candidate's y-intercept value.</p> <p>The values must not be written as fractions or given to only one significant figure.</p>	1
11(e)(i)	<p>Correct unit for A: s^2 Correct unit for B: s^2</p>	1
1(e)(ii)	<p>Correct calculation of g with correct unit, e.g. cm s^{-2}</p>	1

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Question	Answer	Marks
2(a)(i)	Final d value in the range 0.025 m to 0.035 m	1
	Raw d measured to the nearest 0.001 m.	1
2(a)(ii)	Absolute uncertainty in d in range 0.002 m to 0.006 m	1
	Correct method of calculation to find percentage uncertainty e.g. absolute uncertainty/value from (a)(i) $\times 100$. If repeated readings have been taken, then the uncertainty can be half the range if the working is clearly shown, but NOT zero if values are equal.	
2(b)	Circuit set up without help from the Supervisor, V value with unit in the range 1.0 V to 3.0 V	1
	Circuit set up without help from the Supervisor, R value with unit in range 0.20 k Ω to 20 k Ω (200 Ω to 20 000 Ω)	1
2(c)	Second value of L	1
	Second values of V and R	1
	Second value of R larger than first value of R	1
2(d)(i)	Two values of k calculated correctly. The final k values must not be written as fractions or given to only one significant figure.	1
2(d)(ii)	Justification for significant figures in k linked to significant figures in V , d , R and Z .	1
2(e)	Calculation of percentage difference between candidate's two k values and comparison of percentage difference with 5%, leading to a consistent conclusion.	1
2(f)	Value of λ determined.	1

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Question	Answer	Marks
2(g)(i)	<p>1 mark for each point up to a maximum of 4.</p> <p>A Two readings are <u>not enough to draw a conclusion</u> wtte e.g. reference to relationship.</p> <p>B Difficulty with aligning the LDR and LED or difficulty positioning the LDR above the LED</p> <p>C Difficult to measure d with a reason e.g. parallax error / cannot identify top of LED / ruler not steady or large % uncertainty in d</p> <p>D Wire short circuits or poor connections with crocodile clips.</p> <p>E Value R is affected by (changes in) ambient light.</p> <p>F Change in R is small with reason e.g. LED not bright enough, difference between ambient light and LED too small.</p>	4
2(g)(ii)	<p>1 mark for each point up to a maximum of 4.</p> <p>A Take more readings (for different values of d) <u>and</u> plot a graph or take more readings <u>and</u> compare k values</p> <p>B Method to improve aligning e.g. use a set square with detail, use a plumbline.</p> <p>C Method to improve measuring d e.g. Use calipers / pointers on rule / travelling microscope / clamp rule (for measuring d).</p> <p>D Mount wire on a strip / use a variable resistor (instead of the wire) / fixed resistors (instead of the wire)/ improved method of connection e.g. soldering</p> <p>E Place LDR and LED in a tube / conduct experiment in a dark room.</p> <p>F Method to produce a larger change in R e.g. use a longer wire W, brighter LED, lower resistor F, higher resistivity of wire W, thinner wire W.</p>	4