

Cambridge International AS & A Level

PHYSICS

9702/34

Paper 3 Advanced Practical Skills 2

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 **12** 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

PUBLISHED

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
OOOR	value out of range

PUBLISHED

Question	Answer	Marks
1(a)(i)	Final value W in range $34.0 \text{ cm} \leq W \leq 36.0 \text{ cm}$, with unit seen somewhere	1
1(a)(i)	Final Value of N in range 30.0 to 55.0 cm, with unit seen somewhere	1
1(a)(i)	Value of raw L to nearest mm, with unit seen somewhere	1
1(a)(ii)	Correct calculation of Z	1
1(b)	Six sets of readings of W (different values), N and L with correct trend and without help scores 4 marks, five sets scores 3 marks etc. Correct trend is L increases as W increases.	4
1(b)	Range: $W_{\min} \leq 28.0 \text{ cm}$ and $W_{\max} \geq 45.0 \text{ cm}$	1
1(b)	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. W/cm . Z must have no unit.	1
1(b)	Consistency: All raw values of N must be given to the nearest mm.	1
1(b)	Significant figures: All values of Z given to the same number of sig. figs as (or one more than) the least s.f. in the corresponding values of N and W .	1
1(c)(i)	Axes: Axes must be labelled with the correct quantities . Scales must be chosen so that the plotted points occupy at least half the graph grid in both the x and y directions. Scale markings are no more than 2 cm (one large square) apart. Sensible scales must be used, no awkward scales (e.g. 3 : 10 or fractions).	1

PUBLISHED

Question	Answer	Marks
1(c)(i)	Plotting of points: All observations in the table must be plotted on the grid. Diameter of plotted points must be \leq half a small square. Points must be plotted to an accuracy of half a small square in both x and y directions.	1
1(c)(i)	Quality: General trend of points must be positive. All points in the table must be plotted (at least 5) for this mark to be awarded. It must be possible to draw a straight line that is within ± 0.02 on the Z axis of all plotted points.	1
1(c)(ii)	Line of best fit: 'Best fit' is judged by the balance of all points on the grid (at least 5 points) about the candidate's line. There must be an even distribution of points either side of the line along the full length. Lines must not be kinked or thicker than half a square. Some candidates may choose to identify an anomalous point. If 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.	1
1(c)(iii)	Gradient: gradient sign on answer line consistent with graph drawn. The hypotenuse of the triangle used should be greater than half the length of the drawn line. Both read-offs must be accurate to half a small square in both the x and y directions. Method of calculation must be correct, not $\Delta x / \Delta y$.	1

PUBLISHED

Question	Answer	Marks
1(c)(iii)	<p>y-intercept: Either Intercept read directly from the graph, with read-off at $x = 0$, accurate to half a small square in y direction. Or Correct read-off from a point on the line is substituted into $y = mx + c$ or an equivalent expression. Read-off accurate to half a small square in both x and y directions</p>	1
1(d)	<p>a equal to candidate's gradient value, and b equal to candidate's intercept value. Values must not be written as fractions or to only one significant figure.</p>	1
1(d)	<p>Units for a and b correct and consistent with readings (e.g. cm for a and cm for b).</p>	1

PUBLISHED

Question	Answer	Marks
2(a)	Final Value for x in range 1.40 cm to 2.00 cm, with unit seen somewhere.	1
2(b)(i)	Raw value for h to the nearest mm, with unit	1
2(b)(ii)	Absolute uncertainty of 1 or 2 mm and correct method of calculation to obtain percentage uncertainty in h . If several readings have been taken, then the absolute uncertainty can be half the range if working shown clearly, but NOT zero if values are equal.	1
2(c)(i)	Value for d in the range 1.80 to 2.00 cm	1
2(c)(ii)	Final value of t in the range 3.00 to 10.00 s and Raw values of time all to 0.1 s or all to 0.01 s, with unit seen somewhere	1
2(c)(ii)	Evidence of repeat readings of t .	1
2(d)	Second value of d	1
2(d)	Second value of t	1
2(d)	Value for second t less than first t .	1
2(e)(i)	Two values of k calculated correctly. Final values not written as fractions or given to only one significant figure.	1
2(e)(ii)	Justification for significant figures in k linked to significant figures in t , h , x and d .	1
2(f)	Calculation of percentage difference between candidate's two k values. Comparison of percentage difference with 30% leading to a consistent conclusion.	1

PUBLISHED

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> owtte e.g. reference to relationship or not enough k values to draw a conclusion.</p> <p>B Difficulty with measurement of h e.g. large percentage / fractional uncertainty in h; Scale markings do not start at zero at end of ruler.</p> <p>C Difficult to determine t with reason. e.g. Difficult to judge when ball reaches end of track / goes into box</p> <p>D Difficult to measure d with reason, e.g. parallax</p> <p>E Problem with ball rolling / moving on track <u>described</u> e.g. ball falls off track / motion is uneven / (small) ball gets stuck in track (as diameter less than or close to x)</p> <p>F Problem with the track <u>described</u> e.g. Track bends with large ball / width of track varies along its length / box moves due to impact with ball (so distance rolled varies)</p>	4

PUBLISHED

Question	Answer	Marks
2(g)(ii)	<p>1 mark for each point up to a maximum of 4.</p> <p>A Take more readings (for different diameter balls) <u>and</u> plot a graph / calculate more k values and <u>compare</u></p> <p>B Use calipers (to measure h)</p> <p>C Improved timing method: e.g. video (/ record / film) <u>and</u> with a timer (in view) / use frame-by-frame or pressure switch or light gate at end of track connected to <u>timer</u></p> <p>D Use micrometer / calipers (to measure ball diameter)</p> <p>E Use larger diameter ball(s) / narrower track (to avoid ball sticking in track) Use (spirit) level to check width is horizontal (to avoid ball falling off)</p> <p>F Method to improve stability of track: e.g. use a metal track / place other supports under track</p>	4