CAMBRIDGE
International Education

Cambridge International AS & A Level

PHYSICS **9702/35**

Paper 3 Advanced Practical Skills 1 **May/June 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 May/June 2025 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

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

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

Question	Answer	Marks
1(a)	Value of T_0 in the range 1.0–1.4 s with unit.	**1**
	At least two sets of nT where $n \geqslant 5$.	**1**
1(b)	$T < T_0$.	**1**
1(c)	Six sets of readings of h and time with correct trend (T increases as h increases) and without help from Supervisor scores 5 marks, five sets scores 4 marks etc.	**5**
	Range of h : $h_{min} \leqslant 4.0$ cm **and** $h_{max} \geqslant 8.0$ 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.	**1**
	Consistency: All values of h must be given to the nearest mm.	**1**
	Calculation: Correct calculation of T / T_0.	**1**
1(d)(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**
	Plotting of points: All observations in the table must be plotted on the grid. Diameter of plotted points must be $\leqslant$ half a small square. Points must be plotted to an accuracy of half a small square in both x and y directions.	**1**
	Quality: Trend of points must be positive. All points in the table (at least 5 points) must be plotted on the grid for this mark to be awarded. It must be possible to draw a straight line that is within $\pm$ 5 mm (to scale) on the h-axis of all plotted points.	**1**

Question	Answer	Marks
1(d)(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 6 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.	**1**
1(d)(iii)	Gradient: The hypotenuse of the triangle used must 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 $\Delta x / \Delta y$. Gradient sign on answer line must be consistent with graph drawn.	**1**
	y-intercept: 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.	**1**
1(e)	P = candidate's gradient value **and** Q = candidate's intercept value. Values must not be written as fractions or given to only one significant figure	**1**
	Units for P: cm^{-1} or m^{-1} consistent with readings **and** no units for Q.	**1**

Question	Answer	Marks
2(a)	All raw value(s) of t to the nearest 0.01 mm **or** all raw values to the nearest 0.001 mm **and** final value in the range 0.80(0)–1.20(0) mm.	**1**
2(b)(i)	All raw x to the nearest mm **and** final value of x in the range 9.5–10.5 cm.	**1**
2(b)(ii)	Raw value of y to the nearest mm.	**1**
	Value of y in the range 3.0–5.0 cm.	**1**
2(b)(iii)	Percentage uncertainty based on absolute uncertainty in y in range 2–5 mm. Correct method of calculation to find percentage uncertainty. If repeated readings have been taken, then the uncertainty can be half the range (but not zero) if the working is clearly shown.	**1**
2(b)(iv)	Correct calculation of y^2 / m^2.	**1**
2(b)(v)	Justification for significant figures in y^2 / m^2 linked to significant figures in y and m only.	**1**
2(c)	Second values of t, m and x.	**1**
	Second value of y.	**1**
	Second value of y > first value of y.	**1**
2(d)	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(e)	Calculation of percentage difference between candidate's two k values. Comparison of percentage difference with 20%, leading to a consistent conclusion.	**1**

Question	Answer	Marks
2(f)(i)	A Two (sets of) readings are not enough to draw a (valid) conclusion (**not** "not enough for accurate results", "few readings"). B Difficult to draw lines with a reason e.g. because card is hanging / card or string moves when line being made / card not vertical. C Mass of putty not taken into account. D Difficulty in measuring *x* with a reason e.g. judging centre of the mass / placing the centre of the mass where required / mass covers up the mark made for *x*. E Difficulty in locating centre of gravity or difficulty in accuracy of *y* with a reason e.g. string is too thick / card sticks on the nail / nail is too thick. *1 mark for each point up to a maximum of 4.*	**4**
2(f)(ii)	A Take more readings and plot a graph **or** take more readings and compare *k* values (**not** "repeat readings" on its own). B Make a mark and then take off and draw line on the card on the bench **or** clamp rule vertically. C Measure mass of putty and add to the masses / measure the total mass of the masses and the putty **or** use a specified lighter adhesive e.g. tape or glue. D Measure to near and far side and average for *x*. E Use thinner string / thinner nail / use a pin / make hole bigger or smoother. *1 mark for each point up to a maximum of 4.*	**4**