CAMBRIDGE
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Cambridge International AS & A Level

PHYSICS **9702/38**

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.

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 P in range 5.00 to 15.00 s, with unit seen somewhere	**1**
	Evidence of repeated measurement of P	**1**
1(b)	Six sets of readings of z (different values) and P with correct overall trend and without help scores 5 marks, five sets scores 4 marks etc. Correct trend is P decreases as z increases.	**5**
	Range: at least one reading of $z \leqslant 10$ g **and** at least one reading of $z \geqslant 70$ g	**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. $1 / \sqrt{M}$ ($g^{-½}$)	**1**
	Consistency: All raw values of P must be given to the nearest 0.01 s or **all** to the nearest 0.1 s.	**1**
	Significant figures: All values of $1 / \sqrt{M}$ must be given to 3 s.f. or 4 s.f.	**1**
	Calculation: $1 / \sqrt{M}$ calculated correctly	**1**

Question	Answer	Marks
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**
	Plotting of points: All observations **in the table** must be plotted on the grid. Diameter of plotted points must be ⩽ half a small square. Points must be plotted to an accuracy of half a small square in both *x* and *y* directions.	**1**
	Quality: General trend of points must be negative. 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 $\pm$ 0.001 $g^{-1/2}$ on the $1 / \sqrt{M}$ 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**

Question	Answer	Marks
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**
1(c)(iii)	*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	**1**
1(d)	Value of *a* = candidate's gradient value **and** Value of *b* = candidate's y-intercept value. The values must not be written as fractions or given to only one significant figure.	**1**
	Units for *a* and *b* correct and consistent with readings (e.g. $g^{½}s^{-1}$ for *a* and s^{-1} for *b*)	**1**

Question	Answer	Marks
2(a)	Raw values of d to the nearest mm and final value in range 5.00 to 7.00 cm.	**1**
2(b)	Correct calculation of T given to 3 or 4 significant figures	**1**
2(c)(i)	Raw value (s) of x to nearest mm	**1**
	Evidence of repeat readings of x	**1**
2(c)(ii)	Absolute uncertainty of 2 mm to 6 mm and correct method of calculation to obtain percentage uncertainty in x. If several readings have been taken, then the absolute uncertainty can be half the range, provided the working is shown clearly, but not zero if values are equal.	**1**
2(c)(iii)	Correct calculation of y	**1**
2(d)	Second value of T	**1**
	Second value of x	**1**
	Quality – second x less than first x	**1**
2(e)(i)	Two values of k calculated correctly. Final values not written as fractions or given only to one significant figure.	**1**
2(e)(ii)	Justification based on the significant figures in T, x and y.	**1**
2(f)	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(g)(i)	**1 mark for each point up to a maximum of 4.** 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. B Difficulty with <u>*F*</u> with reason, e.g. maintaining steady reading or 5.0 N / keeping newton meter steady / checking value of *F* at the same time as measuring x / holding newton meter horizontally / zero error on newton meter C <u>*x*</u> has a large percentage uncertainty. D Difficulty with <u>*x*</u> with reason e.g. parallax / no reference point at start or end position / hard to hold ruler steady / checking newton meter at the same time as measuring *x* (*award checking newton meter/checking value of F only once*). E Friction over nails affects <u>*T*</u>. F Difficulty with <u>*d*</u> with reason e.g. nails not aligned vertically / judging the centre of the nails	**4**
2(g)(ii)	**1 mark for each point up to a maximum of 4.** A Take more readings (for different values of *M*) <u>and</u> plot a graph OR calculate more *k* values <u>and</u> compare. B Clamp newton meter / use (spirit) level to ensure newton meter is horizontal / video / record / film with newton meter and ruler in view / use mass hanger over pulley C Increase *d* / increase *F* / decrease *T* D Use of a vertical reference e.g. plumb line / string between bottom two nails / grid behind string / clamped pointer (for *x*) or clamped ruler (for *x*) E Replace nails with pulleys / use smoother string with example e.g. waxed thread / nylon string F Use plumb line / measure from the top of one nail to the top of the other nail owtte / use (vernier) caliper and subtract or add diameter (*award plumb line only once*).	**4**