
PHYSICS

9702/32

Paper 3 Advanced Practical Skills 2

May/June 2018

MARK SCHEME

Maximum Mark: 40

Published

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This document consists of **7** printed pages.

Question	Answer	Marks
1(a)(i)	Value of h to nearest mm, with unit.	1
1(a)(ii)	Value of t in the range 1.0–5.0 s, with unit.	1
	At least two readings of t .	1
1(b)	Six sets of readings of h and t showing the correct trend and without help from the Supervisor scores 4 marks, five sets scores 3 marks etc.	4
	Range: $t_{\max} \geq 2.0$ s and $t_{\min} \leq 1.5$ s.	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. $(1/t^2)/\text{s}^{-2}$.	1
	Consistency: All raw values of t must be given to 0.01 s or all must be given to 0.1 s.	1
	Significant figures: Significant figures for every value of $1/t^2$ same as, or one greater than, the number of s.f. of t as recorded in table.	1
	Calculation: Values of $1/t^2$ calculated correctly to the number of s.f. given by the candidate.	1

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Question	Answer	Marks
1(c)(i)	Axes: Sensible scales must be used, no awkward scales (e.g. 3:10 or fractions). Scales must be chosen so that the plotted points occupy at least half the graph grid in both x and y directions. Scales must be labelled with the quantity that is being plotted. Scale markings should be no more than three large squares apart.	1
	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 (no “blobs”). Plots must be accurate to within half a small square in both x and y directions.	1
	Quality: All points in the table must be plotted (at least 5) for this mark to be awarded. Scatter of points must be no more than $\pm 0.05\text{s}^{-2}$ from a straight line in the $1/t^2$ direction.	1
1(c)(ii)	Line of best fit: Judge by balance of all points on the grid about the candidate's line (at least 5). There must be an even distribution of points either side of the line along the full length. Allow one anomalous only if clearly indicated (i.e. circled or labelled) by the candidate. Lines must not be kinked or thicker than half a small square.	1
1(c)(iii)	Gradient: The hypotenuse of the triangle used must be greater than half the length of the drawn line. The method of calculation must be correct. Do not allow $\Delta x / \Delta y$. Both read-offs must be accurate to half a small square in both the x and y directions. Sign of gradient must match graph.	1
	y-intercept: Correct read-off from a point on the line substituted into $y = mx + c$ or an equivalent expression. Read-off must be accurate to half a small square in both x and y directions. or Intercept read directly from the graph, with read-off at $x = 0$ accurate to half a small square in y direction.	1
1(d)	Value of a equal to candidate's gradient and value of b equal to candidate's intercept.	1
	Unit for a correct (e.g. $\text{mm}^{-1}\text{s}^{-2}$ or $\text{cm}^{-1}\text{s}^{-2}$) and unit for b is s^{-2} .	1

Question	Answer	Marks
2(a)	Value for L to nearest mm with unit and in range 50.0–75.0 cm.	1
2(b)	Value for x with unit.	1
	Raw value(s) of x to nearest mm and value on answer line in range 100–200 mm.	1
2(c)	Absolute uncertainty in x value of 0.2–0.5 cm and correct method of calculation to obtain percentage uncertainty. If repeated readings have been taken, then the absolute uncertainty can be half the range (but not zero) if the working is clearly shown.	1
2(d)	Correct calculation of λ to the number of significant figures used by the candidate.	1
2(e)	Justification linking s.f. in λ to s.f. in L .	1
2(f)	Correct calculation of f .	1
2(g)	Second values of L and x .	1
	Quality: x increases as μ increases.	1
	Second values of λ and f .	1
2(h)(i)	Two values of k calculated correctly.	1
2(h)(ii)	Valid comment consistent with the calculated values of k , testing against a numerical criterion specified by the candidate.	1

Question	Answer	Marks
2(i)(i)	A Two readings are not enough to draw a (valid) conclusion (not “not enough for accurate results”, “few readings”). B Difficult to see string <u>pattern</u>. C String pattern dies away quickly. D Difficult to produce <u>exact pattern</u> required. E Difficulty with wooden block e.g. doesn't grip blade/hard to hold down block and oscillate blade/view pattern at same time. F Hacksaw/mass not at a node in the string pattern. <i>1 mark for each point up to a maximum of 4.</i>	4
2(i)(ii)	A Take many readings <u>and</u> plot a graph or take more values of k <u>and</u> compare (not “repeat readings” on its own). B Put contrasting/black/white background behind string. C Use photo/video <u>to assess pattern</u> or description of workable method of producing continuous oscillations. D Add a scale/marks to hacksaw blade. E Clamp/put weight on the movable wooden block. F Workable solution to allow a node e.g. move excitation point away from node/use heavier mass. <i>1 mark for each point up to a maximum of 4.</i>	4