Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

PHYSICS **9702/34**

Paper 3 Advanced Practical Skills 2 **October/November 2019**

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.

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Question	Answer	Marks
1(d)(ii)	Line of best fit: Judge by the balance of all points on the grid (at least 5) about the candidate's line. There must be an even distribution of points either side of the line along its full length. One anomalous point is allowed only if clearly indicated (i.e. circled or labelled) by the candidate. There must be at least 5 points left after the anomalous point is disregarded. Line must not be kinked or thicker than half a square.	**1**
1(d)(iii)	Gradient: The hypotenuse of the triangle used must be greater than half the length of the drawn line. Method of calculation must be correct, e.g. not $\Delta x / \Delta y$. Both read-offs must be accurate to half a small square in both the x and y directions.	**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 the y direction.	**1**
1(e)	a equal to candidate's gradient **and** b equal to candidate's intercept. The values must not be fractions.	**1**
	Unit for a is correct (e.g. $s^2 m^{-2}$) **and** unit for b is correct (s^2).	**1**
1(f)	Value for g calculated correctly.	**1**

Question	Answer	Marks
2(a)	Value for h to nearest mm and in range 7–13 mm.	**1**
2(b)	Value for W to nearest 0.1 N and in the range 1.0 N $\leqslant W \leqslant$ 5.0 N.	**1**
2(c)(i)	Evidence that d has been measured to find r.	**1**
2(c)(ii)	Correct calculation of α.	**1**
2(c)(iii)	Justification based on s.f. in $(r - h)$ and r.	**1**
2(d)	Raw values for F to nearest 0.1 N with unit.	**1**
	Evidence of repeat readings of F.	**1**
2(e)	Percentage uncertainty based on an absolute uncertainty in F of 0.1–0.4 N. If repeated readings have been taken, then the uncertainty can be half the range (but not zero) if the working is clearly shown. Correct method of calculation to obtain percentage uncertainty.	**1**
2(f)	Values for second W, r and F.	**1**
	Quality: Second F less than first F.	**1**
2(g)(i)	Two values of k calculated correctly.	**1**
2(g)(ii)	Valid comment relating to the calculated values of k, testing against a criterion specified by the candidate.	**1**

Question	Answer	Marks
2(h)(i)	A Too few readings/(only) two readings not enough to draw a (valid) conclusion (**not** 'not enough for accurate results', 'few readings'). B Large percentage uncertainty in *h* **or** *h* is small so large uncertainty in *h.* C Difficult to measure <u>diameter</u> with reason, e.g. because diameter not clearly defined, edge is tapered. D Difficult to measure *F*/read newton meter with a reason, e.g. difficult to judge moment when cylinder starts to roll/cylinder moves suddenly/non-zero reading on newton meter when horizontal. E Force applied at different angles for each cylinder/difficult to pull newton meter horizontally. F Large percentage uncertainty in *F* **or** values of *F* small so large uncertainty in *F*. *1 mark for each point up to a maximum of 4.*	**4**
2(h)(ii)	A Take more readings <u>and</u> plot a graph or take more readings <u>and</u> compare *k* values (**not** 'repeat readings' on its own). B Use vernier/digital calipers or micrometer. C Improved method of measuring diameter, e.g. measure between set squares/put blocks either side and measure between blocks. D Use system of pulley and weights/sand **or** Pointer/marker that stays in maximum position on newton mete/use force sensor and data-logger **or** Video/film/record experiment with newton meter in view. E Method of applying force horizontally, e.g. use longer loop of thread/support newton meter with additional board. F Use e.g. 0–5 N newton meter (**not** 'more accurate meter'). *1 mark for each point up to a maximum of 4.*	**4**