UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2012 question paper

for the guidance of teachers

9702 PHYSICS

9702/35 Paper 3 (Advanced Practical Skills 1), maximum raw mark 40

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 must be read in conjunction with the question papers and the report on the examination.

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2012 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

1 (b) (ii) Ammeter reading with unit, in range 1 mA < I < 1 A. Must see n = 3. [1]

(c) Six sets of readings of I and n scores 5 marks, five sets scores 4 marks etc.
Incorrect trend then –1. Correct trend is I decreases as n increases.
Major help from Supervisor –2. Minor help from Supervisor –1. [5]

Range of 6 or 7. [1]

Column heading: [1]
Each column heading must contain a quantity and a unit where appropriate.
The unit must conform to accepted scientific convention e.g. I / A, I (A), I in A, n + 1 /I / A^{-1}.

Consistency: [1]
All values of I must be given to the nearest 0.1 mA or better.

Significant figures: [1]
Significant figures for every row of values of (n + 1) / I same as or one greater than s.f. in I, as recorded in the table.

Calculation: [1]
Values of (n + 1) / I calculated correctly.

(d) (i) Axes: [1]
Sensible scales must be used, no awkward scales (e.g. 3:10).
Scales must be chosen so that the plotted points must 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 must be no more than 3 large squares apart.

Plotting of points: [1]
All observations in the table must be plotted.
Diameter of plots must be ≤ half a small square (no 'blobs').
Work to an accuracy of half a small square.

Quality: [1]
Judge by scatter of all points about best fit line. All points in the table must be plotted for this mark to be scored. At least 5 plots needed.
All points must be within 0.2 of n from a best line.

(ii) Line of best fit: [1]
Judge by balance of all points on the grid about the candidate's line (at least 5 points).
There must be an even distribution of points either side of the line along the full length.
Allow one anomalous point only if clearly indicated by the candidate.
Line must not be kinked or thicker than half a small square.

(iii) Gradient: [1]
The hypotenuse of the triangle must be at least half the length of the drawn line.
Both read-offs must be accurate to half a small square in both x and y directions.
Do not allow $\Delta x / \Delta y$.

y-intercept: [1]
Either:
Check correct read off from a point on the line and substituted into $y = mx + c$.
Read off must be accurate to half a small square in both *x* and *y* directions.
Or:
Check read-off of intercept directly from the graph.

(e) Value of *P* = candidate's gradient. Value of *Q* = candidate's intercept. [1]
Do not allow fractions.

(f) Value of *V* in range $1\text{V} \leq V \leq 2\text{V}$. [1]

(g) *R* with appropriate unit Ω or V A^{-1}. Expect 50 Ω or $0.05\,\text{V mA}^{-1}$ or 0.05 kΩ [1]

[Total: 20]

2 (b) (ii) Value of *x* with unit to the nearest mm in range: $40.0\text{ cm} \leq x \leq 60.0\text{ cm}$. [1]

(c) (ii) Value of x_1 with consistent unit. [1]

(iii) Correct calculation of d_1 with unit. [1]

(iv) Absolute uncertainty in d_1 in range 2 – 5 mm. [1]
If repeated readings have been taken, then the absolute uncertainty can be half the range. Correct method shown to find the percentage uncertainty

(d) (ii) Value of x_2. [1]

(e) (iii) Value of $1\text{ s} < T < 4\text{ s}$. [1]
Evidence of repeats. [1]

(f) Second value of *T*. [1]
Second value of *T* < first value of *T*. [1]

(g) (i) Two values of *k* calculated correctly. [1]

(ii) Justification of sf in *k* linked to <u>significant figures</u> in *d* and *T*. [1]

(iii) Sensible comment relating to the calculated values of *k*, testing against a criterion specified by the candidate. [1]

(h)

	(i) Limitations **4 max.**	**(ii)** Improvements **4 max.**	No credit/not enough
A	two results not enough	take more readings with discs of <u>other materials / mass</u> and plot a graph/ calculate more *k* values and <u>compare</u>	repeat readings few readings
B	reason why difficult to record/ measure x_2/x_1 directly	use a taller /narrower shape take measurement to each end and average/ hole in middle to see x_1/x_2/ hang masses with string	
C	difficult to get circular shape/flat top/ same shape/ two shapes not the same because of groove in 100 g mass	use a mould/ use a plane surface to press down on plasticine	use rubber masses
D	pivot/100 g mass moved while x_2 being determined	method of securing 100 g mass to rule/ rubber pivot	fix pivot and ruler
E	oscillation not in one plane only		
F	difficult to determine end/start of oscillation/ difficult to turn through 90° each time	use of (fiducial) marker(s)/ video with timer	use a protractor

[Total: 20]