UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary and Advanced Level

MARK SCHEME for the November 2004 question paper

9702 PHYSICS

9702/03 **Paper 3 (Practical Test), maximum raw mark 25**

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. This shows the basis on which Examiners were initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the *Report on the Examination*.

- CIE will not enter into discussion or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the November 2004 question papers for most IGCSE and GCE Advanced Level syllabuses.

Grade thresholds taken for Syllabus 9702 (Physics) in the November 2004 examination.

	maximum mark available	minimum mark required for grade:		
		A	B	E
Component 3	25	22	20	14

The thresholds (minimum marks) for Grades C and D are normally set by dividing the mark range between the B and the E thresholds into three. For example, if the difference between the B and the E threshold is 24 marks, the C threshold is set 8 marks below the B threshold and the D threshold is set another 8 marks down. If dividing the interval by three results in a fraction of a mark, then the threshold is normally rounded down.

November 2004

GCE A AND AS LEVEL

MARK SCHEME

MAXIMUM MARK: 25

SYLLABUS/COMPONENT: 9702/03

PHYSICS
Paper 3 (Practical Test)

1 (b) Uncertainty = 1 mm (i.e. 0.5 mm at each end) **1**

Percentage uncertainty in first value of *d* **1**
(i.e. ratio correct and x 100)
If working not clear (e.g. bald 0.4% to 0.5%), then 1/2 in this section

(c) (ii) Repeated readings in first set of measurements
There must be at least two values of *t*. **1**

(d) **Readings** **3**
Expect to see 6 sets of raw readings (1 mark).
Write the number of readings as a ringed total by the table.
Check a value for T^2. Underline checked value and tick if correct (1 mark).
If the number of oscillations has not been recorded, do not award this mark.
If T^2 incorrect, write in correct value. Ignore small rounding errors.
Check a value for d^3. Underline this value and tick if correct (1 mark).
If incorrect, write in correct value. Ignore small rounding errors.
Minor help given by Supervisor, then -1. Excessive help then -2.

Reasonable time used for oscillations **1**
At least half of the raw times must be greater than 20 s.

Quality of results **1**
Judge by scatter of points about the line of best fit.
This mark may be scored for 5 trend plots with small scatter.
Wrong trend/curved trend will not score this mark.
This mark can only be scored if the plotted points occupy more than 2 large squares in the y-direction.

Column headings **2**
Apply to T^2 and d^3 only. One mark each.
The headings must contain a quantity and a unit

Consistency in raw values **2**
Apply to *t* and *d* only. One mark each
All the values of *t* should be given to the nearest 0.01 s or 0.1 s.
All the values of d must be given to the nearest millimetre.

Significant figures **2**
Apply to T^2 and d^3 only. One mark each.
All the values of T^2 must be given to 3 or 4 s.f.
If *d* given to 1 s.f., then accept d^3 to 1 or 2 s.f.
If *d* given to 2 s.f., then accept d^3 to 2 or 3 s.f.
If *d* given to 3 s.f., then accept d^3 to 3 or 4 s.f.
Check each value by row in the table.

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(e) **Axes** **1**

Scales must be such that the plotted points occupy at least half the graph grid in both the *x* and *y* directions. Scales must be labelled with the quantity plotted. Ignore units.
Do not allow awkward scales (e.g. 3:10, 6:10, 7:10 8:10 etc.). There must be no more than 3 large squares without a scale marking.

Plotting of points **1**

Write the number of plots as a ringed total on the graph grid. All observations must be plotted. Check a suspect plot. Circle and tick if correct. If incorrect, show correct position with arrow, and -1. Work to half a small square.

Line of best fit **1**

There must be a reasonable balance of points about the line of best fit. Allow one 'off trend' plot to be ignored. Only allow a straight line through a linear trend.

Determination of gradient **1**

Δ used must be greater than half the length of the drawn line.
$\Delta x/\Delta y$ scores zero. Check the read-offs. Do not allow tangents to curves.

***y*-intercept** **1**

The value may be read directly or calculated using $y = mx + c$ and a point on the line. Work to half a small square.

(f) Gradient equated with *k* **1**

Do not award this mark if wrong graph (e.g. *T* vs *d*, d^3 *vs* T^2 etc.)

Value of *k* with unit (e.g. $s^2\ m^{-3}$ or $s^2\ cm^{-3}$) **1**

Unit must be consistent with value. Any POT error will not score this mark.

Intercept equated with $\frac{4\pi^2 l}{g}$ **1**

Value of *g* with unit (e.g. $m\ s^{-2}$ or $cm\ s^{-2}$) **1**

This mark is conditional on the previous mark being scored.
Unit must be consistent with value. Value should be 19.7/*y*-intercept.
Method of working must be correct.

Simultaneous equation method can score 1 mark if the units of *k* and *g* are correct.

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(g) (i) Calculation of d when $T = 2$ *s* **1**
Method of working must be correct. A final numerical answer is expected

(ii) d too large for case (approx 45 cm width). **1**
Accept sensible answers consistent with candidate's result from **(g) (i)**.
Be generous. Accept values to 0.50 m as small. Some justification needed.

25 marks in total

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