UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2006 question paper

9702 PHYSICS

9702/03 Paper 3 (Practical 1), maximum raw mark 25

This mark scheme is published as an aid to teachers and students, 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.

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.

The grade thresholds for various grades are published in the report on the examination for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses.

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

CIE is publishing the mark schemes for the October/November 2006 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

UNIVERSITY of CAMBRIDGE
International Examinations

Part (b) (ii) First value for d in range 0 to 1.0 m and correct working for T **1**
(i.e. mass in kg x 9.8. Expect to see 1.47 N. Ignore sf.)

Part (c) Percentage uncertainty in d (must show working) **2**
Δd = 1 mm to 5 mm (1 mark)
Ratio correct and x 100 (1 mark)

Part (d) (i) Readings **6**
6 sets of readings in the table scores 6 marks; 5 sets then 5 marks etc.
Don't allow a set of readings where suspended mass is 0.
Check a value for $\sqrt{T}$. Tick if correct.
If incorrect, write in correct value and – 1.
Minor help from Supervisor then – 1. Major help then – 2.

Repeated readings **1**
For each value of T there must be at least two values of d.
Do not award this mark if all the length readings are identical for every T value.

Quality of results **1**
At least five points must be plotted to qualify for this mark.
Judge by scatter of points about the line of best fit (all d values within ± 0.03 m of marker's best line).
Do not award this mark if the wrong graph has been plotted (i.e. the quality cannot be judged), or if there is a negative or curved trend.
Do not award this mark if range of d is less than 0.20 m.

Column headings **1**
Apply to $\sqrt{T}$ only.
Expect to see $\sqrt{T}$ /$N^{1/2}$ or $\sqrt{T}$ ($N^{1/2}$) or $\sqrt{(T/N)}$ etc.

Consistency **1**
Apply to raw values of d only.
Check values by row; decimal places must be the same in every row.

Part (d) (ii) Justification of sf in $\sqrt{T}$ **2**
Must be same as or one better than (1 mark) the sf in T or M (1 mark).
'Raw values' ideas get one out of two marks only.
Ignore references to sf in g.
Reference to decimal places scores zero.

© UCLES 2006

Part (e) (i) 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 etc).
Allow reversed axes.

Plotting of points **1**
All points 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 at least 5 trend points.
There must be a reasonable balance of points about the line of best fit.

Part (e) (ii) Determination of gradient **1**
Δ used must be greater than half the length of the drawn line;
read-offs must be correct to half a small square.

Part (f) Gradient equated with $1/2f\sqrt{m}$ **1**

Correct method of working to give value of *m,* i.e. substitution of gradient value, not substitution of a point **1**

Value of *m* in range 0.40 g m^{-1} to 0.60 g m^{-1} (or ± 0.10 g m^{-1} of SV) **1**

Unit of *m* correct (e.g. g m^{-1}). Independent mark. **1**

Part (g) Difficulty (must be non-trivial, with sufficient detail). **1**
e.g. difficult to measure d (accurately)
e.g. wire difficult to see
e.g. hard to tell when amplitude is maximum
e.g. difficult to hold plug/rule still
e.g. parallax error

Improvement (detail may be clear from the 'difficulty'). **1**
e.g. mount ruler in stand
e.g. mount plug in stand
e.g. put coloured card behind wire

25 marks in total.

© UCLES 2006