CAMBRIDGE
INTERNATIONAL EXAMINATIONS

June 2003

GCE ADVANCED SUBSIDIARY LEVEL AND ADVANCED LEVEL

MARK SCHEME

MAXIMUM MARK: 25

SYLLABUS/COMPONENT: 9702/03

PHYSICS
Paper 3 (Practical (AS))

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

1 (a) (iv) % uncertainty in θ — 2/1/0

Accept $\Delta\theta$ to $\pm 1^\circ$ $\pm 2^\circ$ (1 mark)

Ratio and percentage ideas correct (1 mark)

(d) (i) Measurements — 3/2/1/0

Expect to see at least 6 sets of results (1 mark)

Less than 6 sets does not score this mark

Check a value of T^{-4}. Underline checked value and tick if correct (1 mark)

Ignore small rounding errors. This mark cannot be awarded if there are no raw times, number of oscillations measured in a fixed time, or the stopwatch has been misread. If there is no record of the number of oscillations then this mark cannot be scored

It may be necessary to refer to page 3 of script for a value of n

Check a value for $\cos\theta$. Underline checked value and tick if correct (1 mark)

Ignore small rounding errors. Expect to see a correct sign

If either incorrect, write in correct value and -1 eeoo

Minor help given by Supervisor, -1. Major help, then -2

(d) (i) Repeated readings — 1

For each value of θ there must be at least two values of t

An average value does **not** have to be calculate

(d) (i) At least 10° between the readings of θ — 1

(d) (i) Quality of results — 2/1/0

Judge by scatter of points about Examiner line of best fit

6 reasonable trend plots with little scatter (2 marks)

5 trend plots, or some scatter of plots (1 mark)

Large scatter/no trend/wrong quantities plotted (zero)

(d) (i) Column headings — 1

Check the $1/T^4$ column heading only

Quantity and unit (s^{-4}) must be correct

(d) (i) Consistency — 2/1/0

Apply to raw values of θ **and** t only (one mark each)

Values of θ must all be given to the nearest degree. Do not allow tenths of a degree

Values of t must all be given to the nearest 0.1 s or 0.01 s

Do not apply to average values

(d) (ii) Justification of number of sf in cos θ — 1

Answer must relate sf in θ to sf in cos θ

Do not allow answers in terms of decimal places

Do not allow vague answers that are given in terms of 'raw data'

(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 (i.e. 4 x 6 in portrait or 6 x 4 in landscape)

Axes must be labelled with the quantity plotted. Ignore units. Do not allow awkward scales or gaps of more than three large squares between the scale markings

(e)	**(i)**	Plotting of points Check a suspect plot. Circle and tick if correct. If incorrect, show correct position with arrow, and -1. Work to half a small square. All observations must be plotted	1
(e)	**(i)**	Line of best fit There must be a reasonable balance of points about the line of best fit There must be at least 5 plots on the grid for this mark to be awarded Do not allow a straight line to be drawn through a distinct curve trend Allow an acceptable curve through a curved trend of points	1
(e)	**(ii)**	Determination of gradient Hypotenuse of Δ used must be greater than half the length of the drawn line Check the read-offs and ratio. Read-offs must be accurate to half a small square Do not allow this mark if a curve has been drawn	1
(e)	**(ii)**	*y*-intercept The value must be read to half a small square Do not allow this mark if a curve has been drawn	1
(f)		*A* = candidate's value of gradient	1
(f)		*B* = candidate's value of intercept	1
(f)		Unit of *A* and *B* **both** correct (s^{-4})	1
(g)		Measurement of *L* The value should be in the range 40 cm $\pm$ 2 cm. Can be implied in the working It may be necessary to refer to the Supervisor's Report	1
(g)		Correct method of working to give a value for *g* in range 9.0 to 11.0 m s^{-2} A POT error anywhere in the working will not score this mark	1
(g)		Sf in *g* Allow 2 or 3 sf only. Apply to any value given A bald value with no working cannot score this mark	1
(g)		Unit of *g* correct (and consistent with other measurements, e.g. *L*) There must be a numerical value of *g* for this mark to be scored A bald value with no working cannot score this mark	1

25 marks in total