CAMBRIDGE
INTERNATIONAL EXAMINATIONS

NOVEMBER 2002

GCE Advanced Subsidiary Level

MARK SCHEME

MAXIMUM MARK : 25

SYLLABUS/COMPONENT :9702 /3

PHYSICS
(PRACTICAL (AS))

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

Measurements

M1 Measurements **6**
Write the number of readings as a ringed total by the results table.
One mark for each set of readings to a maximum of 6 marks
Check a value for *T*. If incorrect then -1.

M2 Repeated readings **1**
For each value of *T* there must be at least two values of *t*.
An average value must be calculated.

M3 At least half the raw times > 10 s **1**

M4 Quality of results **1**
Judge by scatter of points about the line of best fit.

Results

R1 Column headings **1**
Each column heading must contain a quantity and a unit.

R2 Consistency **1**
Apply to *t* and *d*.
Values of *d* must be given to the nearest millimetre.
Values of *t* must be given to the same number of decimal places.
Do not allow *t* to be given to a whole number of seconds or 0.001 s.

R3 Sf in *k* **1**
Accept two or three significant figures only.

Graphical work

G1 Axes **1**
Scales must be such that the plotted points occupy at least half the graph grid in both the *x* and *y* directions.
Sensible scales must be used (i.e. 2:10 or 5:10 etc.)

G2 Plotting of points **1**
Write the number of plots as a ringed number on the graph grid.
All observations must be plotted.
The plots must be accurate to half a small square.

G3 Line of best fit **1**
Judge by scatter of points about the line of best fit.
Do not allow a straight line to be drawn through a curved trend.

G4 Determination of gradient **1**
The hypotenuse of the triangle must be greater than half the length of the line which has been drawn.
Check the read-offs.

G5 Intercept **1**
The value may be read or calculated from $y = mx + c$.

Analysis

A1 k = candidate's gradient **1**

A2 c = candidate's y-intercept **1**

A3 Unit of k and unit of c correct **1**

A4 Sensible suggestions relating to direct proportionality **2**
One mark for 'straight line' ideas.

A5 Correct working to give period when $d = 5$ mm **1**

A6 Oscillations are too quick to time manually **2**
Magnets may stick together at this small separation
One mark each.

25 marks in total

Special cases

S1 Graph gives a clear curved trend of plots;
M4 = 0; G3 = 0 (if straight line drawn); A4 can only score 1/2 max.

S2 Negative value of T when $d = 5$ mm;
A5 = 0. Allow ecf into A6 if possible.

Sample results.

$20T_1$/s	$20T_2$/s	$20T_{av}$/s	T/s	d/cm
26.6	27.0	26.8	1.34	9.7
20.9	20.7	20.9	1.04	7.6
17.2	17.2	17.2	0.860	6.3
13.8	13.7	13.8	0.688	5.1
9.6	9.6	9.6	0.465	3.6
6.4	6.5	6.5	0.324	2.3

Gradient = 0.143

y-intercept = -0.04

Hence $k = 0.143$ s cm^{-1} and $c = -0.04$ s