

**NOVEMBER 2002**

**GCE Advanced Subsidiary Level**

<b>MARK SCHEME</b>
<b>MAXIMUM MARK : 25</b>
<b>SYLLABUS/COMPONENT :9702 /3</b> <b>PHYSICS</b> <b>(PRACTICAL (AS))</b>



### 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  $k = 0.143 \text{ s cm}^{-1}$  and  $c = -0.04 \text{ s}$*