

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL
General Certificate of Education Advanced Level

MARKING SCHEME

JUNE 2011

PHYSICS

9188/4

1 Measurements and observations

M1 Readings 2

Write the number of readings as a ringed total by the results table.

5/6 sets of readings scores 2 marks. 2/2

4/5 sets of readings scores 1 mark. 1/2

3/4 sets of readings scores 0 marks etc. 0/2

If help given by supervisor then -1, excessive help then -2.

If help is given from the Supervisor then write 'SR' in a ring at the top of the front page of the candidate's script. Also, please indicate the type of help given in a written comment by the table of results.

M2 Repeated reading (loading & unloading) 1

M3 Quality of results 1
Judge by scatter of points about the lines of best fitM4 Measurement of t repeated and average calculated \bar{t} 1

Presentation of results

R1 Column headings 1

Every column must be headed with a quantity and a correct unit.
Allow $h/m, h$ in $m, h(m)$ or a solidus notation occupying two lines
Do not allow hm, hv or just h (with no unit).R2 Consistency of raw readings given in the table of result. 1
Apply to raw values of h and m only. $h/mm - 0dp$ $h/cm - 1dp$ $h/m - 3dp$
All raw readings of a particular quantity must be given to the same degree of precision (e.g. if one value of h is measured to 2 d.p. then all values of h should be given to 2 d.p.).
Write \checkmark at the foot of the column for each correct column of raw readings.
Ring any inconsistency noted, write Xc at the foot of the column, and -1.R3 Consistency of w and t 1 $h/mm - 0dp$ $h/cm - 1dp$ $h/m - 3dp$

Graphical Work

Apply G1, G2, G3 to first graph only.

- G1** Axes 1
 Each axis must be labelled with a correct symbol (or description). Ignore units.
 Scales must be such that the plotted points occupy more than half the graph grid in both the x and y directions.
 Do not allow >3 large squares between scale markings on an axis.
 Do not allow awkward scales (e.g. 3:10, 7:10, 8:10 etc.)
- G2** Plotting of points. 1
 Count the number of plots on the grid and write this value by the line and ring it. Do not allow plots in the margin area.
 4 plots only will lose this mark. *Plot 5*
 Check one suspect plot. Circle this plot. Tick if correct.
 If incorrect, mark the correct position with a small cross and use an Arrow to indicate where the plot should have been.
 Allow errors to half a small square.
 If 4 plots have been done then no checking is required.
- G3** Line of best fit. 1
 Only a drawn straight line through a linear trend is allowable for this mark.
 This mark can only be awarded for 5 or more plots on the grid. *circle plot 85*
 There must be a reasonable balance of points about the line which has been drawn.
 Do not allow a line is greater than half a small square thickness.
- G4** measurement of gradient. 1
 Ignore units.
 Hypotenuse of Δ must be $>$ half length of line drawn.
 Check the read-offs. Work to half a small square.
 Do not allow $\Delta x/\Delta y$.

Analysis

- A1 equate gradient to $\frac{4gL^3}{Ewt^3}$ 1
- A2 Correct substitution to find E $E = \frac{L}{\text{Grad}} \frac{4g(L)}{t^3}$ 1
- A3 Units of E $\text{kg m}^{-1}\text{s}^{-2}$. (A) Pa. 1
- A4 Intercept equated to Q and unit Q/m or Q/cm or Q/mm . 1
- A5 Precautions/avoid overload 1
Parallax error 1

Marks in total

Special cases

- S1 Wrong trend, something gone very wrong M_1^{-1} G_3^{-1} .
- S2 Wrong graph eg h vs t etc Q_1^{-1} Q_3^{-1}
- S3
- S4
- S5

Question 2

Measurements and observations

- M1** Readings 4
- Write the number of readings as a ringed total by the results table.
 Check a value for $\log V_0$. Tick if correct.
 If incorrect, write in correct value and -1 .
 Check a value for $\log V_1$, tick if correct.
 If incorrect, write in correct value and -1 .
 Ignore small rounding errors.
 6 sets of readings scores 4 marks. *1/1*
 5 sets of readings scores 3 marks. *3/3*
 4 sets of readings scores 2 marks etc. *2/4*
 If help given by supervisor then -1 , excessive help then -2 .
 If help is given from the Supervisor then write 'SR' in a ring at the top of the front page of the candidate's script. Also, please indicate the type of help given in a written comment by the table of results.

- M2** Quality of results 1
- Judge by scatter of points about the lines of best fit

- M3** Repeated readings for V_1 *and V_2 calculated* 1

Presentation of results

- R1** Column headings 1
- Every column must be headed with a quantity and a correct unit.
 Allow $V_1(V)$; V_1 in V , V_1/V or a solidus notation occupying two lines.
 Do not allow $V_1 V$ or just V_1 (with no unit).

- R2** Consistency of raw readings given in the table of results. 1
- Apply to raw values of V_1 and V_0 only.
 All raw readings of a particular quantity must be given to the same degree of precision (e.g. if one value of V_1 is measured to 2 d.p. then all values of should be given to 2 d.p.).
 Write \checkmark at the foot of the column for each correct column of raw readings.
 Ring any inconsistency noted, write X_c at the foot of the column, and -1 .

- R3** SF in calculated quantities 1
- Apply to $\log V_1$ and $\log V_0$. *Help in logs = # SF in Result
 1/1 to V_1 & V_0*

Graphical Work

- G1 Axes. 1
 Each axis must be labelled with a correct symbol (or description). Ignore units.
 Scales must be such that the plotted points occupy more than half the graph grid in both the x and y directions.
 Do not allow > 1 large squares between scale markings on an axis.
 Do not allow awkward scales (e.g. 3:10, 7:10, 8:10 etc.)
- G2 Plotting of points 1
 Count the number of plots on the grid and write this value by the line and ring it. Do not allow plots in the margin area.
 5 plots only will lose this mark. *Plot 7/5*
 Check one suspect plot. Circle this plot. Tick if correct.
 If incorrect, mark the correct position with a small cross and use an arrow to indicate where the plot should have been.
 Allow errors to half a small square.
 If 4 plots have been done then no checking is required.
- G3 Line of best fit. 1
 Only a drawn straight line through a linear trend is allowable for this mark.
 This mark can only be awarded for 5 or more plots on the grid.
 There must be a reasonable balance of points about the line which has been drawn.
 Do not allow a line which is greater than half a small square thickness.
- G4 Measurement of gradient. 1
 Ignore units.
 Hypotenuse of Δ must be $>$ half length of line drawn.
 Check the read-offs. Work to half a small square.
 Do not allow $\Delta x/\Delta y$.

Analysis

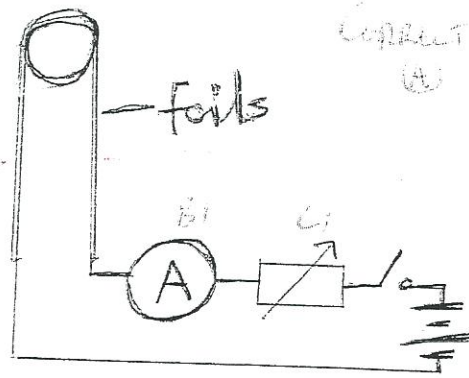
- A1 Equate A to gradient $\frac{\Delta \log V_t}{\Delta \log V_0}$ 1
- A2 Equate y-intercept to $\frac{-10}{RC}$ 1
- A3 Correct substitution (substitution correct in L3.F) 1
- A4 Correct value of A, $A \approx 1$ (0.95 \rightarrow 0.99 \rightarrow 1) 1
- A5 Correct value of C, $C \approx 2200 \mu\text{F}$ (\textcircled{B} $A < 0.95$; $A \geq 1.5$) 1

$$\rightarrow 1950 \mu\text{F} \leq C \leq 2420 \mu\text{F}$$



Question 3.

A1 Diagram



- B1 Method of measuring current 1
- B2 Measure distance between foils or wires 1
- B3 Measure the length of foils 1
- B4 Measure force by using change in separation/forcemeter/ strain gauge 1
Use $F = \frac{\mu_0 I^2 l}{2\pi r}$ ($r = \text{separation}$)
- C1 Vary current using rheostat 1
 Keep initial separation and length of foil constant *and measure F* 1
- C2 Vary distance between foils by moving apart or closer. 1
 Keep current and length constant *and measure F* 1
- C3 Change mass of foil by changing thickness of foil 1
 Keep initial distance and current constant *and measure F* 1
- D1 Experiment to be performed in a draught free room *A) Also be conditions* 1
avoid currents / use of same material
- D2 Use of a strain gauge *(A) Avoid short circuiting* 1