ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

JM

MARKING SCHEME

JUNE 2012

PHYSICS

9188/4

1 M1 measurements and observations 6 obs of x + T & θ (or Repeated & average calc) [3]
Rep Check T sin θ — ss Rounding off
Check Raw (R) major R off errors'
{5 obs - m_1 - 1; 4 obs m_1 - 2; 3 ↓ m_1 = 0}

M2 calculation of percentage error [1]
$\frac{\Delta\theta}{\theta}$ check for least value - θ

M3 quality of results — Least ≥ 5 plots [1]
scatter of plots

M4 ensuring that rule is horizontal [1]
use of — spirit level
— check height with ½ m rule

S_1 {varying mass — M_1 - 1; G_3 - 1; G_1 - 1}

Presentation of results

R1 column headings Q/u [1]

R2 consistence of X, T and θ [1]
x/mm — 0 dp; x/cm — 1 dp; x/m — 3 dp | T/N check from Results — 1 dp | θ/° — 1 dp

R3 significant figures of Tsin θ consistent with either T or θ [1]

(R4 Range and spread of x inclusive 55 ± 0,2 ≤ x ≤ 99,0 — 92) out · [1]

Graphical work

G1 Axes T sin θ vs x (A) reversed axis [1]
occupy ½ of spac, scale not AKWARD, no holes / Gaps.

G2 plotting points All observations to be plotted [1]
≈ ½ ss

G3 line of best fit (R) Thick / hairy / kinked / Hairy [1]
Balances the scatter

G4 determination of gradient Rights ≥ ½ Length of LBF [1]
CRO of Grad points ≈ ½ ss
Subst into Grad Eqn

Analysis

A1 gradient equated to A (A) calculated value = A [1]
$\frac{\Delta T\sin\theta}{\Delta x}$ = A

A2 intercept equated to 4,91M determined intercep = 4,91M [1]
If x — has origin = CRO x ½ ss.

A3 (correct) value of M + correct unit (N). [1]

A4 correct value of A [1]
Value of about 6N/M±10%
(A) 5,94 — 6,60N

A5 significance of A [1]
Spring constant / AW

18

M1 measurement of observations 6 obsew [4]
Check Raw ® major RO errors

M2 Repeat values of t and E calculated [1]

M3 Quality of results [1]
Scatter of plots

Presentation of Results

R1 column headings Q/U [1]
R2 consistence of t and V t/s – 2dp V/V – 1 dp – check per Raw [1]
R3 significant figures in lnV related to sf of V ~~± 2sf~~ (R) (3) sf. [1]
~~R4 spread of V (Vmax recorded) = to V/5 out~~ ~~[1]~~

Graphical work

lnV vs t

G1 Axes scale [1]
G2 plotting of points as in Q1 [1]
G3 line of best fit as in Q1 [1]
G4 determination of gradient as in Q1 [1]

Analysis

A1 gradient equated to $-\frac{1}{CR} = \frac{\Delta \ln V}{\Delta t}$ [1]

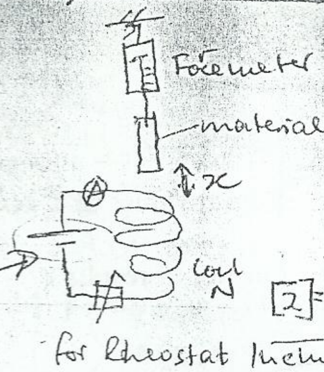
A2 intercept equated to lnV_0 for correct determination of CRO (iff x-has origin) [1]

A3 Value of R = 5,0kΩ ± 5% or ⇒ 10,0kΩ ± 5%. (A) or Any [1]

A4 Calculation and value of Voltmeter resistance correct method for resistors in series [~~2~~ 1]
R – 5kΩ = Rv ≈ 5kΩ.

A5 Value of V_0 [1]
CRO of intercept $\ln V_0$ from Graph.
find $e^{\ln V_0} \approx (2,5 \pm 0,5)V$

[18]



3 A1 Magnetic material suspended from a forcemeter ✓ [1]

A2 A correct circuit A workable circuit set up [2] [2] = [1] + 1 for Rheostat in

B1 Vary current of turns and measure force keeping distance and number of turns constant [1]

B2 Vary number of turns and measure force keeping distance and current constant [1]

B3 Vary distance and measure force keeping current and number of turns constant [1]

C1 How to vary current e.g. use rheostat / Variable Source [1]

C2 How to vary number of turns e.g. change solenoid / solenoids w. varied N terminals. [1]

C3 How to vary the distance e.g. raise the forcemeter (lower)
+ instrument to measure separation / Correct method Δx [1]

D1 Avoid over heating, [1]

D2 by switching off circuit [1]

D3 good further design feature e.g. use of soft iron ore / Avoid short circuit 1

D4 - Vernier scale 1
- clear from other magnetic sources 1 } 3