ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

MARKING SHCEME

NOVEMBER 2004

PHYSICS **9188/4**

1 Measurement and observations

M1 Readings

Write the number of readings as a ringed number by the table.
6 + values of T and M gets $\frac{5}{5}$; 5 gets $\frac{4}{5}$; 4 gets $\frac{3}{5}$. [5] (3)

Check a value for T^2. Underline checked value. Tick if correct.
If incorrect value (-1). If help is given by supervisor then (-1).
Excessive help (-2). If help is given write
SR at the top front page.

M2 Repeated reading of T with an average calculated. ~~[1]~~

M3 Uncertainty in T (accept range 0.1s to 0.4s) ~~[1]~~

M4 Method of reduction of uncertainty use of fiducial marker;
use of second person ~~[1]~~
Practice several times before taking readings use ηT (repeated readings)
Do not allow vague answers such as use of computer or electronic times / light gates / video recorders

M5 Quality of Result (judge by the scatter of points) [2]

Presentation of Results

R1 Column Headings:

Every column heading must contain a quantity and a unit. Ignore units in the body of the table. [1]

R2 Consistency of raw readings
Apply to T only (3 significant figures) [1]

R3 Significant figures in T^2.

(Compare; T and T^2.) [1]

Same as, or 1 more

Graphical Work

G1 Axes: Axes must be labelled.

Sensible scale must be used.
Awkward scales (e.g. 3:10) not allowed.
Plotted points must occupy at least half the graph grid (i.e. 6 of 12 squares and 4 of 8 squares) [1]

G2 Plotting of points. Courtring total.
All observations must be plotted.
Check one suspect plot. Circle this plot.
Allow errors of up to, and including half a small square [1]

G3 Line of best fit (judged by scatter of points about the candidates's line) [1]

Only a drawn straight line through a linear trend is allowable for this mark.
At least 5 plots are needed for this mark to be awarded.

G4 Determination of gradient:

the hypotenuse of the Δ used must be greater than half the length of the drawn line. [1]

Read off must be accurate to half a small square. N.B. (Δx or Δy to one small square)

Analysis of Results

A1 gradient $= \frac{4\pi^2}{K}$ [1]

A2 $K = \frac{4\pi^2}{\text{gradient}}$ and correct units (kg/s^2) [1]

A3 Period (T) when M = 0.35kg [1]

Comment on validity 1

Improvement 1

2 Measurements and Observation

M1 Measurements [5]

M2 Correct value of I for V = 0.7? [1]

M3 Quality of results [1]

Presentation of Results

R1 Column headings [1]

R2 Consistency of raw readings [1]

Graphical work

G1 Axes [1]

G2 Plotting of points [1]

G3 Line of best fit [1]

G4 Quality of tangent [1]

G5 Gradient of tangent at (V = 0.7) [1]

Analysis of Results

A1 a.c. resistance = value of $\Delta V/\Delta I$ [1]

d.c. resistance = value of V/I

A2 Value of a.c. resistance lies in given range} [1]

A3 Value of d.c. resistance lies in a given range} [1]

A4 a.c. resistance > d.c. resistance [1]

A5 Non ohmic conductor, non-linear graph V – I} or [2]

3 A1 Diagram showing two trolleys on a tilted track (or two masses) [1]

A2 Tilted track and trolley experiment to maintain constant velocity (given by tape) [1]

A3 Measure velocity of trolleys before and after the collisions. (1^{st} trolley stationary and 2^{nd} trolley moving. Static friction > dynamic friction) [1]

B1 Logical procedure: (two ticker tapes, threaded tapes, two trolleys in a straight line on the tilted track. 12 V supply and long leads). [1]

B2 Measurement of velocity / How you would interpret velocity from ticker tapes. (Mark allowed if student uses metre rule and stop watch to calculate velocity, repeated times) [1]

B3 Use of the energy conservation law.

$$\frac{1}{2} M_1 V_1^2 + \frac{1}{2} M_2 V_2^2 = \frac{1}{2} M_1 U_1^2 + \frac{1}{2} M_2 U_2^2. \quad [1]$$

B4 Keep tilt constant; mass constant; velocity can be varied several times. [1]

C1 Any other good design features e.g.

(1) use of a stronboscope

(2) use of (set square / spirit level etc.) to verify that the masses are in a straight line.

(3) good method of attaching masses to trolley

(4) very long track