THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

131/3C **PHYSICS PAPER 3C**
ALTERNATIVE C PRACTICAL

TIME: 3 Hours 10 Minutes 04 June 1999 A.M.

INSTRUCTIONS

1. Answer TWO (2) questions including question ONE.
2. Read each question very carefully.
3. Use the first ten (10) minutes to read through the paper.
4. ALL calculations must be clearly presented in the answer book provided.
5. Mathematical tables, graph papers, slide rules and calculators may be used.

This paper consists of 4 printed pages.

1. The aim of this experiment is to determine the radius of gyration, k, of the given wooden bar of length 1m. Proceed as follows:

   (a) Suspend the wooden bar (with holes) provided using a string (or peg) so that it balances horizontally and hence mark the centre of mass G of the bar. Also measure length (L) of the wooden bar.

   (b) Suspend the wooden bar using a knife edge (or a peg) or a strong pin so that it is free to swing in a vertical plane. (See fig. 1)

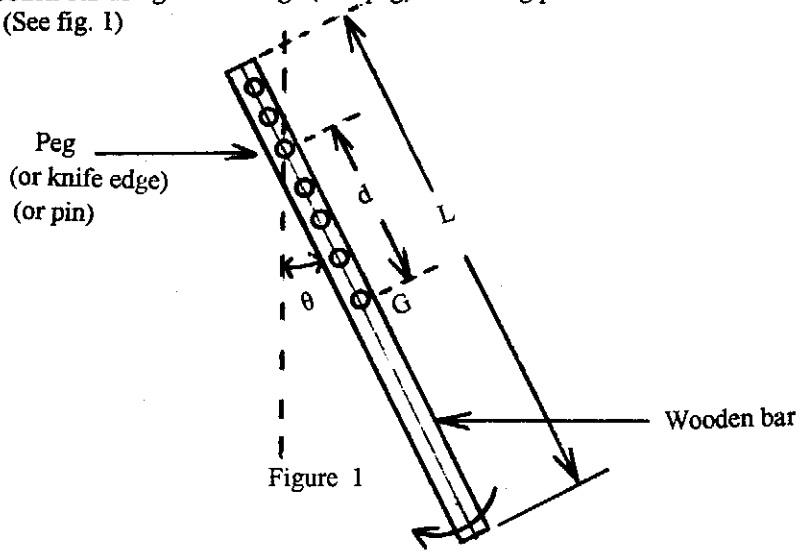

Figure 1

   Measure the distance, d, from the point of suspension to the centre of mass G of the bar.

   (c) Displace the bar at a small angle θ and allow it to swing in a vertical plane. Using a stop watch measure the time for 20 oscillations of the bar.

   (d) Repeat parts (b) and (c) above varying distance, d, to obtain at least 6 data points.

   (e) Record your data using the following table:

No.	d± (m)	Time for 20 oscillations (sec)	Period T (sec)	T^2 (sec^2)	d^2 (m^2)	T^2d (sec^2-m)
1						
2						
3						
4						
5						
6						

   (f) Plot the graph of d^2 (y-axis) against T^2d (x-axis) allowing for the intercepts.

   (g) Given that $d^2 = \frac{g}{4\pi^2} T^2d - k^2$

   Obtain the value of k from the graph in (f). Compare the value of k obtained from the graph to the value $k = \frac{L}{\sqrt{12}}$ where L is the length of the wooden bar.

   (h) Mention any Two sources of errors in this experiment.

2. (a) The aim of this experiment is to determine the boiling points of liquids A and B and to find their rates of cooling at 70°C.

(b) Diagram:

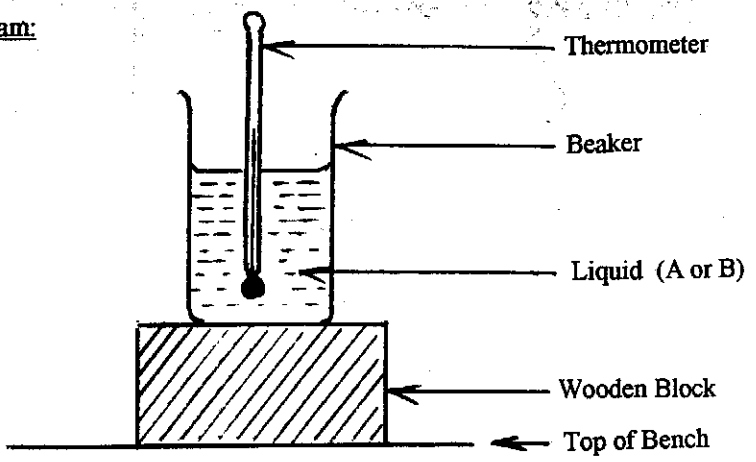

Figure 2

(c) Procedure:

(i) Using one of the beakers, take about 200cm^3 of the warm liquid A and heat it until it boils. Note and record the boiling temperature (θ_A) of liquid A.

(ii) Quickly transfer the beaker of boiling liquid A and place it on the wooden block provided (see figure 2). Note the temperature and immediately start the stop watch.

(iii) While stirring the liquid with your thermometer and constantly fanning with the pieces of paper provided, note and record the temperature of liquid A at two minute intervals as it cools.

(iv) Keep on fanning the beaker, stirring the liquid and recording the temperature until the liquid has cooled to about 55°C.

(v) Record your results in a table of temperature (θ) against the corresponding time (t).

(vi) Plot a graph of θ (vertical axis) against t (horizontal axis). Determine the rate of cooling of liquid A at 70°C.

(vii) Repeat steps (i), (ii), (iii), (iv), (v) and (vi) above for the liquid labelled B.

(viii) What do you think are the liquids (A) and (B)?

3 (a) The aim of this experiment is to determine the internal resistance of a voltmeter.

(b) Diagram

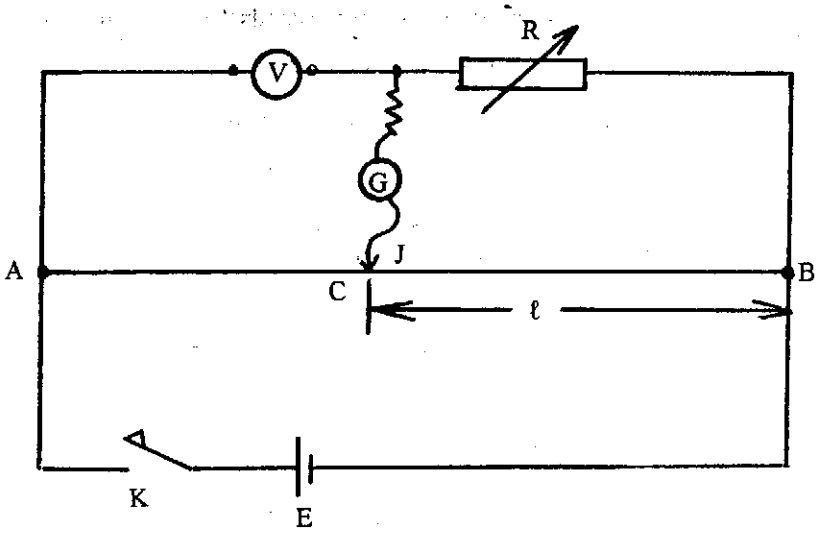

Figure 3

(b) Procedure

(i) Connect the circuit as shown in figure 3 where AB is the potentiometer wire, E is an accumulator, G, J and K are galvanometer, Jockey and Key respectively. R is a variable resistor (Resistance box) and V is a voltmeter.

(ii) Set R at a value such that the voltmeter reads 1.0 volts and obtain a balance point C on the potentiometer wire. Record the values of V, R and ℓ.

(iii) Repeat the experiment with V = 0.9, 0.8, 0.7, 0.6,0.5, 0.4 and 0.3 volts. Record the corresponding values of R, and ℓ in a table as shown below.

V Volts	R Ω	ℓ cm	$\frac{\ell}{100 - \ell}$

(iv) Obtain for each value of V the corresponding value of $\frac{\ell}{100 - \ell}$

(d) (i) Plot a graph of R (vertical) against $\frac{\ell}{100 - \ell}$ (horizontal axis)

(ii) Determine the slope S of the graph.

(iii) If R_V is the resistance of the voltmeter, obtain a formula for the balanced bridge in terms of the balance length ℓ and the corresponding resistance value R.

(iv) From the formula in (iii) above and the graph, calculate the average value of R_V.

(v) Name two sources of error in this experiment.