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

131/3B

PHYSICS 3B

ALTERNATIVE B PRACTICAL
(For Both School and Private Candidates)

Time: 3 Hours Angelp *Thursday 15 May 2003 a.m.*

Instructions

1. This paper consists of **THREE (3)** questions.
2. Answer **ALL** questions.
3. All calculations must be clearly shown.
4. Mathematical tables and **non**-programmable calculators may be used.
5. Cellular phones are **not** allowed in the examination room.
6. Write your Examination Number on every page of your answer booklet(s).
7. The following constant may be used:

   $\pi = 3.14$

This paper consists of 3 printed pages.

1. In this experiment you are required to investigate the oscillations of a chain of paper clips. Proceed as follows:

(a) (i) Firmly clamp the cork using a clamp, boss and stand.

(ii) Attach a chain of n paper clips to the hook as shown in Fig.1 with an initial value of n = 30.

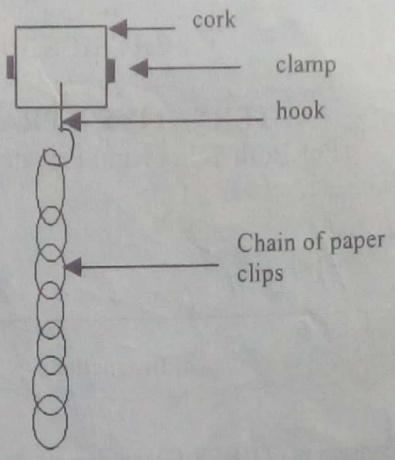

Fig. 1

(iii) Displace the chain from its equilibrium position by moving the bottom clip sideways, and describe briefly how the chain behaves until it reaches a state where it oscillates smoothly and reproducibly.

(iv) When the chain is oscillating smoothly, measure and record the time t for 20 oscillations.

(v) Estimate the uncertainty in your value of t and suggest one way in which this uncertainty could be reduced.

(b) Change the value of n between 30 and 5 and repeat (a) (iv) above until you have six sets of readings of t and n. Include values of the period T for each value of n in your table of results.

(c) For this oscillator, the quantities T and n are related by a simple power law of the form $T = kn^r$ where k and r are constants.

Plot a suitable graph, and using your graph calculate the values of k and r.

(d) How is the period T related to the number of clips n?

2. In this experiment you are required to determine the ratio of $\frac{t_1}{t_2}$.

Proceed as follows:

(a) Weigh the empty calorimeter provided. Read and record the room temperature.

(b) Add 50 cm^3 of liquid A which is about 70 °C hot. Put the lid with thermometer and stirrer and start cooling. Record the time t_1 (min) every 5 °C fall from the beginning and obtain 5 readings.

(c) Weigh calorimeter with liquid A.

(d) Empty and dry the calorimeter, add 50 cm^3 of liquid B. Weigh the calorimeter with liquid B. Repeat the procedure as explained in (b) above working over the same range of temperature, denote the time as t_2 (min).

(e) (i) Tabulate your results

(ii) Plot a graph of the corresponding values of t_1 (min) against t_2 (min).

(iii) Read from the slope of your graph the average value of $\frac{t_1}{t_2}$.

(iv) Evaluate the ratio $\frac{t_1}{t_2}$.

3. In this experiment your are required to determine the end corrections and y of the metre bridge provided.

Proceed as follows:

(a) Set up the circuit as shown in figure 2 below:

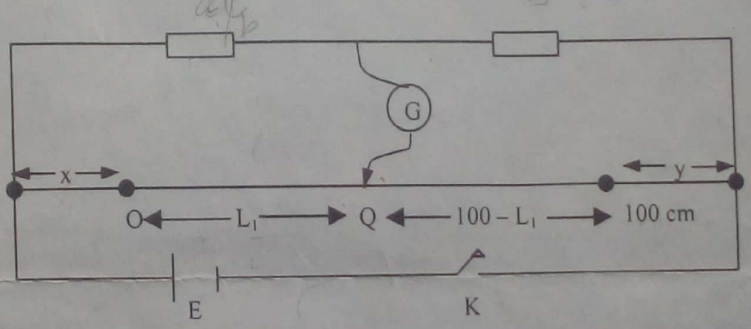

Fig . 2

(b) Using resistor M = 5 Ω and N = 20 Ω read and record the balance length L_1 and the length $100 - L_1$.

(c) Interchange the position of M and N and obtain the new balance length L_2 and $100 - L_2$.

(d) Write the metre bridge equation for parts (b) and (c) above at the balance point.

(e) Use the equations in (d) above to calculate the end corrections x and y.