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

131/3B

PHYSICS PAPER 3B
ALTERNATIVE B PRACTICAL

TIME: 3 Hours 10 Minutes

01 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 booklet 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 both the acceleration due to gravity at your school and the radius of gyration of the given block of wood. Proceed as follows:

Set up the apparatus shown in figure 1.

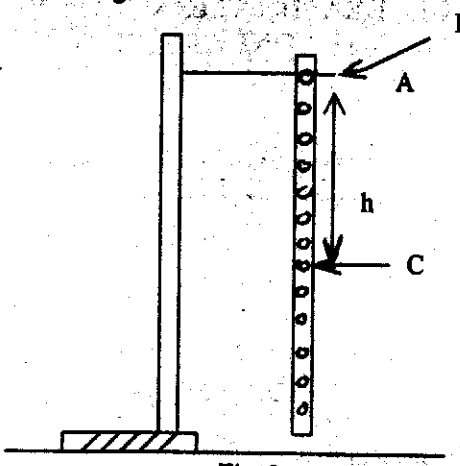

Fig. 1

Find the centre of gravity of the block of wood by balancing it on a sharp edge. Measure length AC which is the distance h from the centre of gravity to the upper part of the hole. Suspend the block of wood through the hole. Displace the block by a small angle and using a stop watch take the time t for 10 small complete oscillations and hence determine the period T.

Repeat the procedure with six other values of h, each case recording the corresponding time t and period T in a table.

The period T is related to h by

$T = 2\pi\sqrt{\frac{h^2 + k^2}{gh}}$; where k is the radius of gyration of the block of wood about the centre of gravity.

Plot the graph of T^2h (y – axis) against h^2. (Both axes of the graph should start with zero).

Use your graph and the equation above to determine.

(a) The acceleration due to gravity

(b) The radius of gyration k of the wood.

2. The aim of this experiment is to determine the boiling points of liquids A and B and to find their rates of cooling under the conditions of the surroundings.

Proceed as follows:

(a) 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 T_A of liquid A.

(b) Quickly transfer the beaker of boiling liquid A and place it on the wooden block provided.

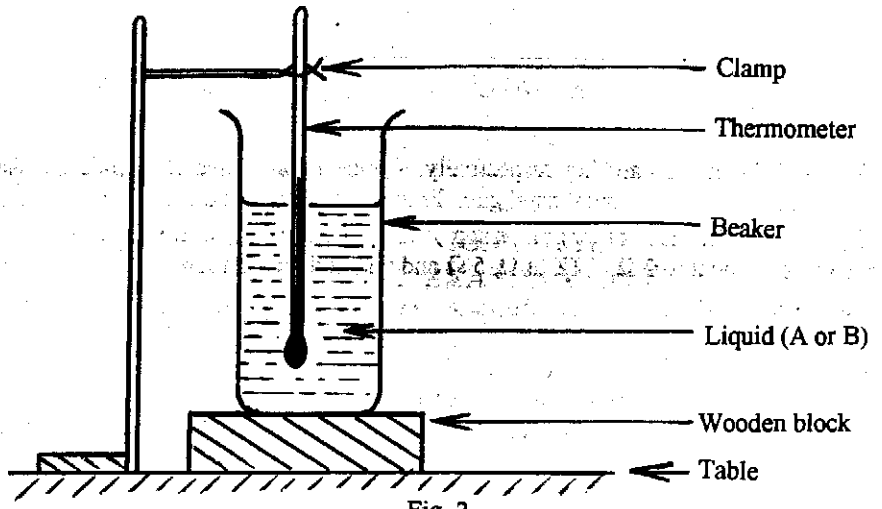

Fig. 2

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

(d) Keep on fanning the beaker, stirring the liquid and recording the temperature until the liquid has cooled to about 50°C.

(e) Tabulate the values of temperature (T) and the corresponding time (t).

(f) Plot the graph of T (vertical axis) against t. Determine the rate of cooling of liquid A at 75°C.

(g) Repeat steps (a) to (f) above for the liquid labelled B.

(h) What is (i) liquid A? (ii) liquid B?

3. The aim of this experiment is to determine the resistivity , p, of the wire of coil C.
Proceed as follows:

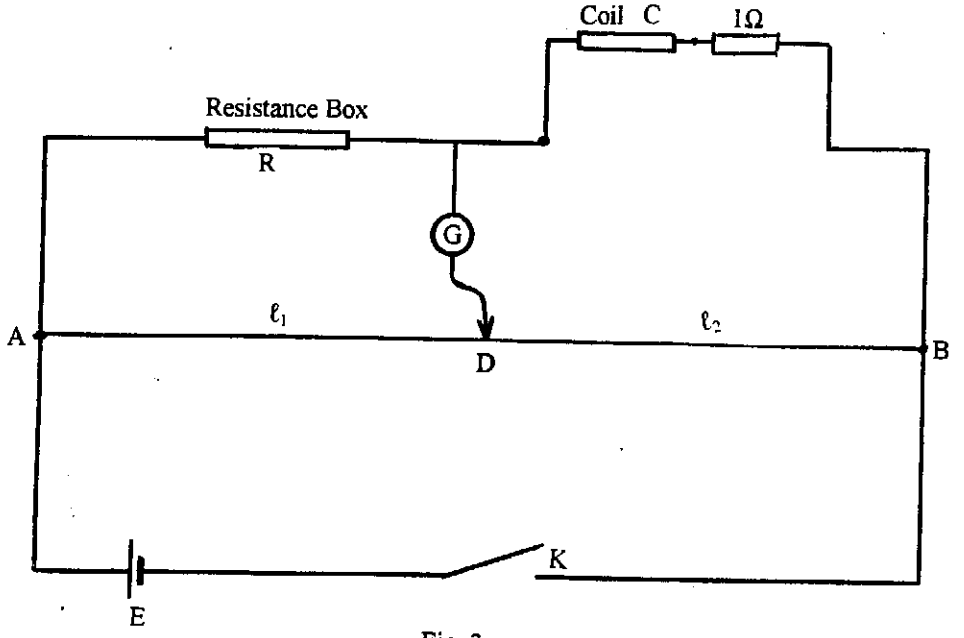

Fig. 3

Set up a metre bridge circuit as shown in the diagram (Fig. 3). In the diagram, G, D, E and K are

galvanometer, jockey, 1.5V dry cell and key respectively. Connect coil C and 1Ω standard resistor in series and connect the system at the right hand gap. From the resistance box choose R = 1 Ω and balance the bridge. Record the value of lengths AD (= ℓ_1) and BD (= ℓ_2). Repeat with R from the resistance box equal to 2 Ω, 3 Ω, 4 Ω, 5 Ω and 6 Ω and record their corresponding values of ℓ_1 and ℓ_2.

Plot a graph of ℓ_1 / ℓ_2 against R (x – axis). Determine the slope S of the graph.
Measure the diameter of the wire of coil C (from the sample given) and calculate its cross-sectional area A.

Calculate p given that

$$P = \frac{A}{L}\left(\frac{1}{S} - 1\right)$$

where L is the length of the wire of coil C.

The supervisor will tell you the value of L.

State any two sources of errors in this experiment.