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

131/3B

PHYSICS 3B
ACTUAL PRACTICAL B
(For Both School and Private Candidates)

Time: 3:20 Hours **Friday, 15th May 2015 a.m.**

Instructions

1. This paper consists of **three** (3) questions.
2. Answer all questions.
3. Question **Number 1** carries 20 marks and the other **two (2)**, 15 marks each.
4. Calculations should be clearly shown.
5. Mathematical tables and non-programmable calculators may be used.
6. Cellular phones are **not** allowed in the examination room.
7. Write your **Examination Number** on every page of your answer booklet(s).
8. Use the following:
   $\pi = 3.14$.
   Specific heat capacity of water, $C_w = 4200 JKg^{-1}K^{-1}$.
   Specific heat capacity of copper, $C_c = 420 JKg^{-1}K^{-1}$.

1. In this experiment you are required to determine the acceleration due to gravity.

Proceed as follows:

(a) Suspend the perforated metre rule provided using a string so that it balances horizontally and hence mark the centre of mass G of the rule.

(b) Then suspend the perforated metre rule using last hole from the centre of gravity on the peg fixed on the stand so that it is free to swing in a vertical plane. Measure the distance h from the point of suspension to the centre of mass G of the rule.

(c) Allow the rule to swing in the vertical plane with a small angle of deflection θ from the vertical plane. Using a stop watch or clock, measure the time for 20 oscillations of the metre rule.

(d) Repeat procedures in 1 (b) and (c) above using 4 holes at an interval of 0.1m.

(e) Tabulate your data as shown in Table 1.

Table 1

Hole	h (m)	Time for 20 oscillations (sec)	Period T (sec)	h^2 (m^2)	T^2h (sec^2 m)
1st hole					
2nd hole					
3rd hole					
4th hole					
5th hole					

(f) (i) Plot a graph of h^2 against T^2h.

(ii) Calculate the slope S of the graph.

(iii) Using the formula $g = 4\pi^2 S$, calculate the acceleration due to gravity.

(iv) From the graph, obtain the value of h when T^2h is zero.

(v) What does the value of h obtained in 1 (f) (iv) represents?

2. In this experiment you are required to plot the cooling curves for hot water in the calorimeter when the calorimeter is:

A: $\frac{1}{2}$ full of water,

B: $\frac{2}{3}$ full of water.

Proceeds as follows:

(a) Half fill a weighed calorimeter with water so that the temperature after this operation is about 60^0C. Observe and record the temperature of the contents at intervals of 2 minutes as it cools over the temperature range of 60^0C to 45^0C, then weigh the calorimeter and its contents. Finally find the mass of water.

(b) Repeat the procedures in 2 (a) with the calorimeter about $\frac{2}{3}$ full of water.

(c) Plot both cooling curves in the same frame of axes.

(i) Use the two curves to obtain the ratio ($\frac{1}{2}$ full to $\frac{2}{3}$ full of water) of times taken to cool over the following temperature intervals:

60^0C – 50^0C; 60^0C – 45^0C and 55^0C – 45^0C.

(ii) Calculate the ratio of the total thermal capacities in the two experiments.

(iii) Give comment(s) on the ratios obtained in 2 (c) (i) and (ii).

(iv) Briefly explain why the shapes of the two curves are not the same.

3. The aim of the experiment is to find the resistivity of the wire using the metre bridge.

Proceed as follows:

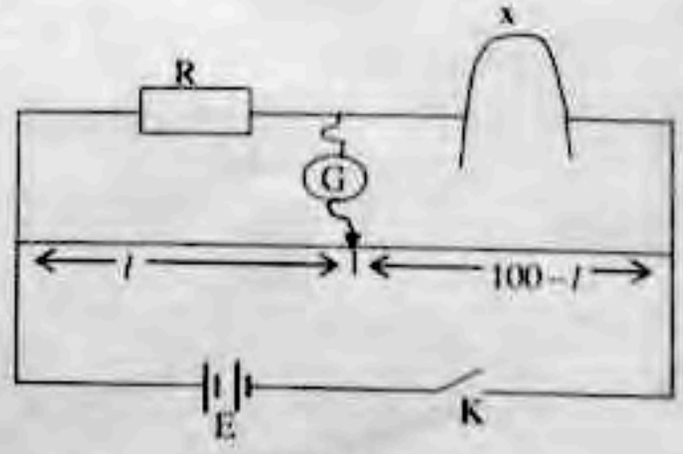

Figure 2

Set up the circuit as shown in Figure 2 where R is 2Ω standard resistor and x is the length of the resistance wire. Find the balance length, l, for x = 20cm. Repeat the same procedures for other four values of x at the intervals of 10cm.

(a) Tabulate the values of x and $\frac{1}{l}$.

(b) Plot a graph of $\frac{1}{l}$ against x.

(c) Find the equation of the graph.

(d) Using the micrometer screw gauge, find the radius of the resistance wire.

(e) From the graph, calculate the resistivity of the wire.