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

131/3A

PHYSICS 3A
ALTERNATIVE A PRACTICAL
(For Both School and Private Candidates)

Time: 3 Hours 10 minutes **2006 February, 17 Friday 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 must clearly be 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. The following information may be useful.

   $\pi = 3.14$.

1. The aim of this experiment is to determine the radius of gyration r of the rectangular sheet of hard-board provided and the acceleration due to gravity g.

Proceed as follows:

(i) Set up the apparatus as shown in figure1 below; (G – is the centre of gravity of the hardboard). Suspend the hardboard from a hole nearest to the centre of gravity G. Record the distance, d, which is the distance of the hole from G.

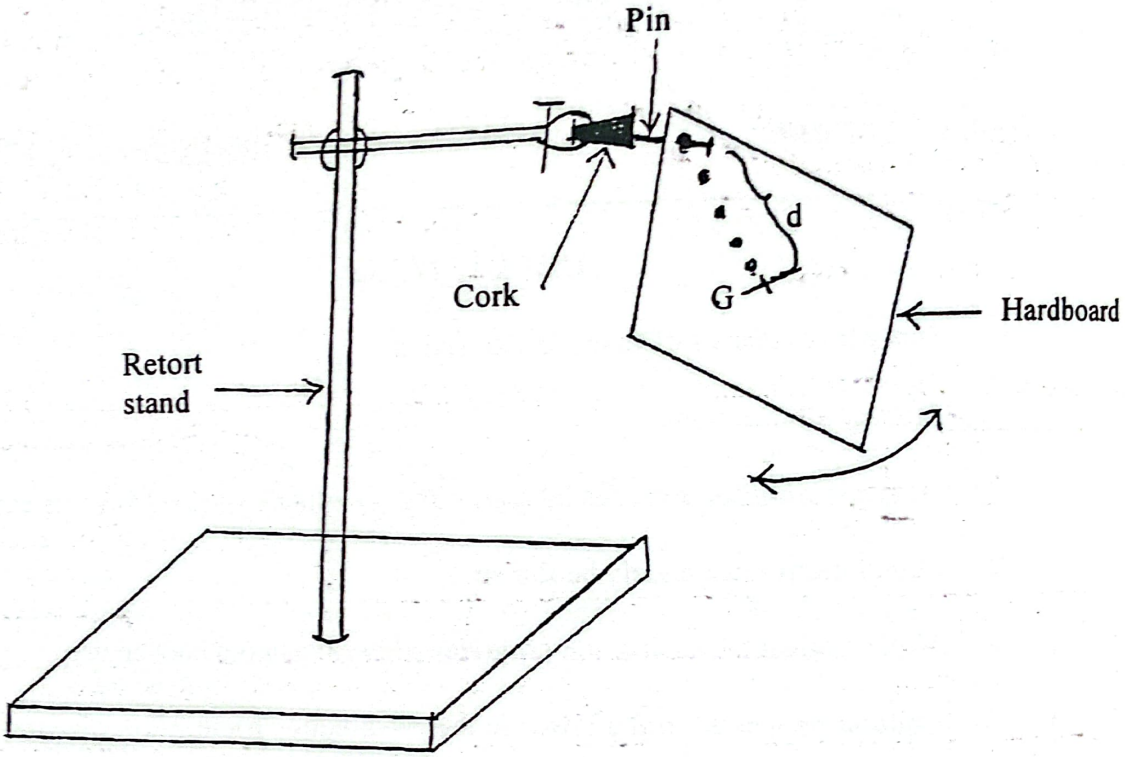

Fig. 1

(ii) Using the stopwatch (or stopclock) provided, obtain the time t for 20 small complete oscillations of the hardboard, and hence calculate the periodic time, T.

(a) Repeat the above procedure (1.(ii)) with 5 other values of d and obtain the corresponding values of T. Tabulate your results.

(b) Plot the graph of T^2d against d^2, with both axes starting at the origin.

(c) Given that $\frac{T}{2\pi} = \left(\frac{r^2 + d^2}{gd}\right)^{1/2}$ determine the:

(i) radius of gyration r.

(ii) acceleration due to gravity g .

2. You are provided with a lid, a thermometer, a stirrer, a stopwatch, a wooden base and a source of liquid L whose initial temperature is above 80 °C.

Using the items provided, carry out an experiment to determine whether or not a sample of liquid L obeys Newton's law of cooling. Take readings at 1.0 minute intervals for 15 minutes.

(15 marks)

3. The aim of this experiment is to determine the electrical resistivity ρ of the wire labelled X.

Proceed as follows:

(i) Set up the slide wire metre bridge as shown in figure 2 below, where E is a 3 V source (2 dry cells in series) and G the galvanometer. Length ℓ_x of the nichrome wire is connected across the right hand gap of the bridge and the jockey is placed at 50 cm mark.

(ii) With R = 60 cm, find the value of ℓ_x which the galvanometer gives zero deflection when the slider is tapped onto the 50 cm mark.

(a) Repeat the procedure in 3.(ii) for values of R = 50 cm, 40 cm, 30 cm, 20 cm and 10 cm.

Tabulate the values of R_1, ℓ_x, $\frac{1}{R}$ and $\frac{1}{\ell_X}$

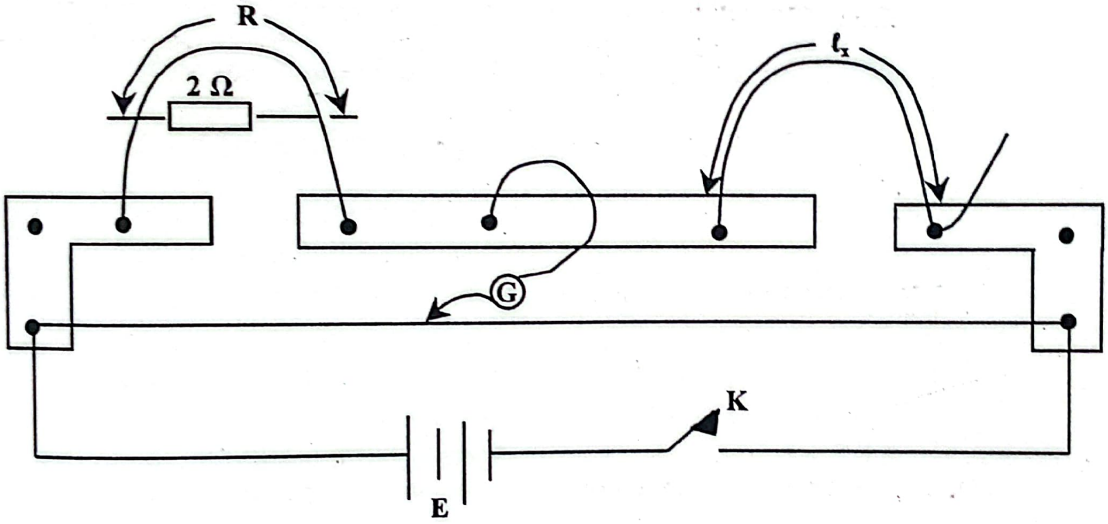

Fig. 2

(b) (i) Measure the diameter of wire R.

(ii) Plot a graph of $\frac{1}{\ell_x}$ against $\frac{1}{R}$.

(iii) Determine the slope and the intercept along $\frac{1}{\ell_x}$.

(c) Calculate the resistivity ρ_x of wire X given that $\frac{1}{\ell_X} = \frac{2}{R} + \frac{\rho_2}{2A_x}$, where A_x is the cross-sectional area of wire X.

(15 marks)