

**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 hardboard provided and the acceleration due to gravity g .

Proceed as follows:

- (i) Set up the apparatus as shown in figure 1 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 .

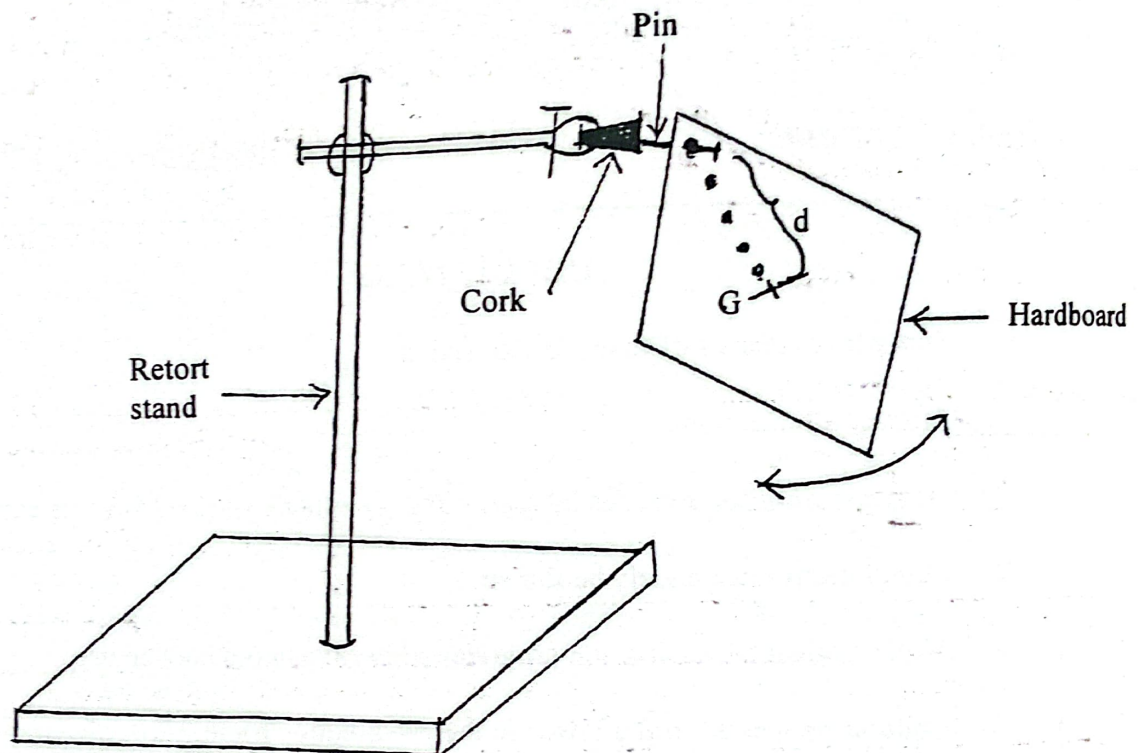


Fig. 1

- (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:
- radius of gyration r .
 - 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 $R = 60\text{ cm}$, 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 $R = 50\text{ cm}$, 40 cm , 30 cm , 20 cm and 10 cm .
Tabulate the values of R , ℓ_x , $\frac{1}{R}$ and $\frac{1}{\ell_x}$.

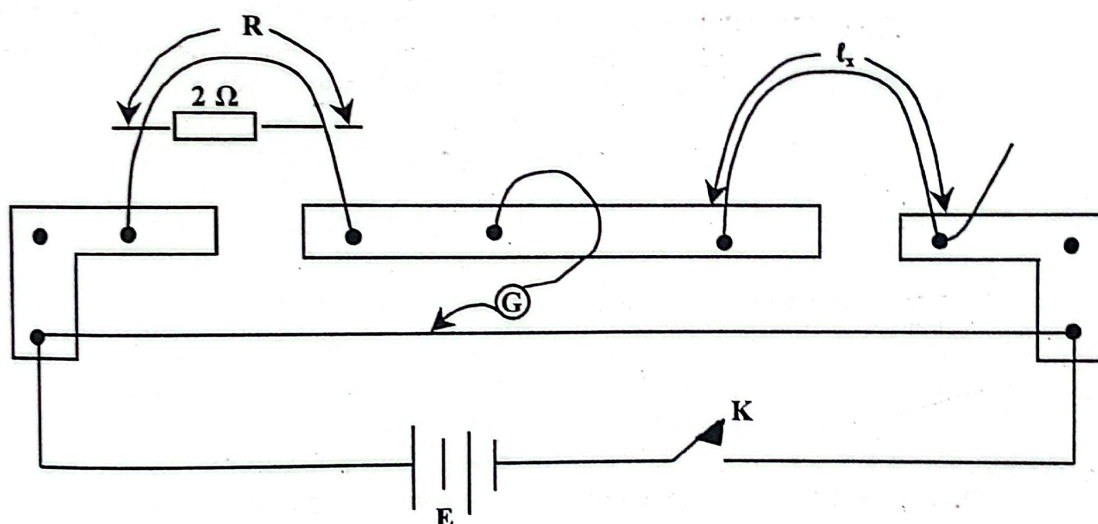


Fig. 2

- (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 $\frac{1}{\ell_x} = \frac{2}{R} + \frac{\rho_x}{2A_x}$, where A_x is the cross-sectional area of wire X.
(15 marks)