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

131/3A

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

**Time: 3:10 Hours** **Monday, 18th February 2013 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:

   $\pi = 3.14$



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1. The aim of this experiment is to determine the acceleration due to gravity, g, by simple pendulum.

Proceed as follow:

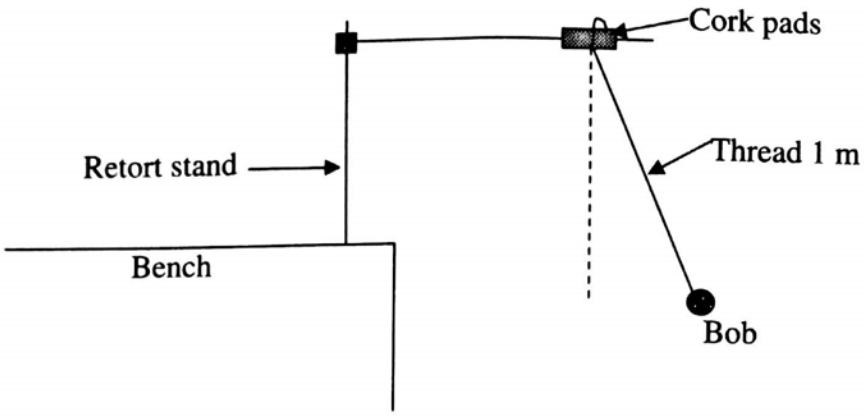


**Figure 1**

(a) Using a pointer, place a reference mark at the equilibrium position of the bob. Set the bob to oscillate through a small angle and begin counting the number of oscillations through the equilibrium position of the bob. Find the time for 30 complete oscillations.

(b) Measure the length, $l$, of the thread from the point of suspension to the point of attachment of the bob and record the result in metres (m).

(c) By raising the thread each time, shorten the length of the pendulum by about 10cm, 20cm, 30cm and 40cm.

(d) On each occasion, find the length of the thread in metres and the time for 30 complete oscillations. Tabulate your results.

(e) Plot the graph of $l$ against $T^2$, where T is the period of the oscillations related by the equation:

$T = 2\pi\sqrt{\frac{l+c}{g}}$ and c is the small constant length from the point of attachment of the bob to the centre of gravity of the bob.

(f) Determine the acceleration due to gravity, g.

(g) Mention any two sources of errors.

2. You are provided with a calorimeter and stirrer, thermometer, water bath containing hot water maintained at 90°C, stopwatch and a cardboard.

Proceed as follows:

(a) Fill the calorimeter with hot water about $\frac{3}{4}$ full. Put the calorimeter containing



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hot water on a cardboard placed over the bench. Starting with $\theta = 75^{o}C$ record temperature after 2 minutes intervals. Take your reading for 20 minutes.

Note: Stir water thoroughly until the end of your experiment.

(b) Record the room temperature at the beginning and at the end of the experiment. Find the average temperature $\theta_s(^{o}C)$.

(c) Tabulate your results.

(d) Plot a graph of $\log_{10}(\theta - \theta_s)$ against time, t.

(e) Given that $A = \log_{10}(\theta - \theta_s) + Kt$ where A is a constant.

Determine the value of K and constant A.

(f) (i) From the graph, state the relation between the rate of loss of heat from a calorimeter and the excess temperature over its surrounding.

(ii) Which law does this relation obey?

3. The aim of this experiment is to determine the resistivity '$\rho$' of the wire labeled X and the internal resistance of the battery provided.

Proceed as follows:

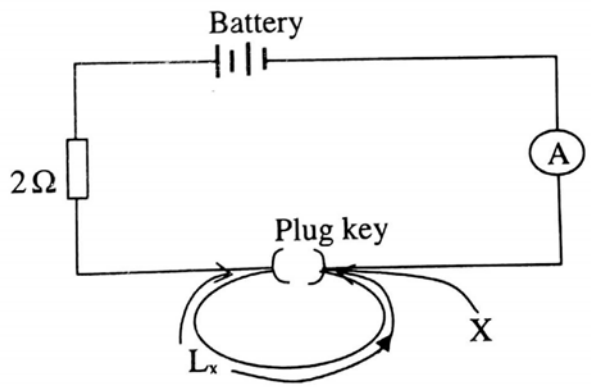


**Figure 2**

(a) Connect the circuit as shown in Figure 2. With the plug key open adjust the length of wire X to a value of $L_x = 20cm$. Note the ammeter reading.

Note: The plug key should remain open throughout the experiment.

(b) Repeat the procedures in part (a) above for $L_x$ = 40cm, 60cm, 80cm and 100cm each time recording the ammeter reading.

(c) Tabulate your results as shown in Table 1.



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Table 1

| Length $L_x$ of wire X (cm) | Current I (A) | $\frac{1}{I}$ ($A^{-1}$) |
|---|---|---|
| | | |

(d) Plot a graph of $\frac{1}{I}$ against $L_x$.

(e) Determine the slope and the $\frac{1}{I}$ intercept of the graph.

(f) Measure and record the diameter of a wire.

(g) Using your graph, determine the resistivity $\rho$ of the wire and internal resistance r of the battery.



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