

**THE UNITED REPUBLIC 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, 18<sup>th</sup> 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:

$$\pi = 3.14$$



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

Proceed as follow:

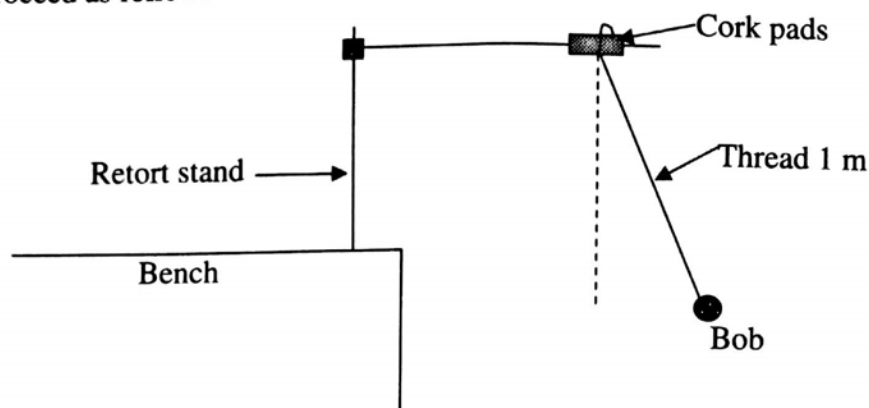


**Figure 1**

- (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  $90^\circ\text{C}$ , stopwatch and a cardboard.

Proceed as follows:

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

hot water on a cardboard placed over the bench. Starting with  $\theta = 75^\circ\text{C}$  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  $\theta_s(^{\circ}\text{C})$ .
- (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:

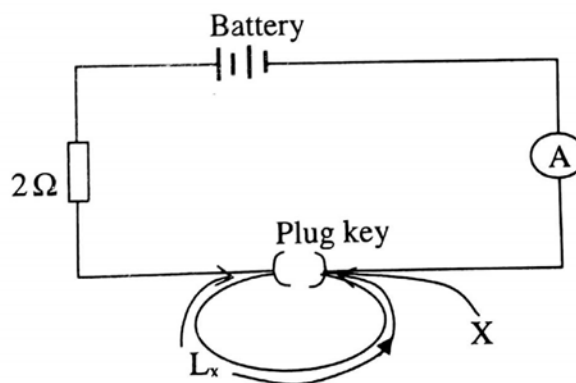


**Figure 2**

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

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

- (b) Repeat the procedures in part (a) above for  $L_x = 40\text{cm}$ ,  $60\text{cm}$ ,  $80\text{cm}$  and  $100\text{cm}$  each time recording the ammeter reading.
- (c) Tabulate your results as shown in Table 1.

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.