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

031/2A

PHYSICS 2A
ACTUAL PRACTICAL A
(For Both School and Private Candidates)

Time: 2:30 Hours **Year: 2023**

Instructions

1. This paper consists of **two** (**2**) questions. Answer **all** the questions.
2. Each question carries **twenty five** (**25**) marks.
3. All writings should be in **blue** or **black** ink, except for diagrams which must be in pencil.
4. Mathematical tables and non-programmable calculators may be used.
5. Communication devices and any unauthorised materials are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet(s).

The following information may be useful:
Pie, $\pi = 3.14$

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1. A Form Four student was walking to school and saw the kids swinging a to and fro motion. The student related the motion of the swings with the oscillations of the simple pendulum discussed at the school. With curiosity the next day, the student decided to design an experiment using the following apparatus; cotton thread, retort stand, pendulum bob, meter rule and stopwatch. Perform the following experiment using those apparatuses and then answer the questions that follow. Proceeds as follows:

(a) Set up the apparatus as seen in Figure 1.

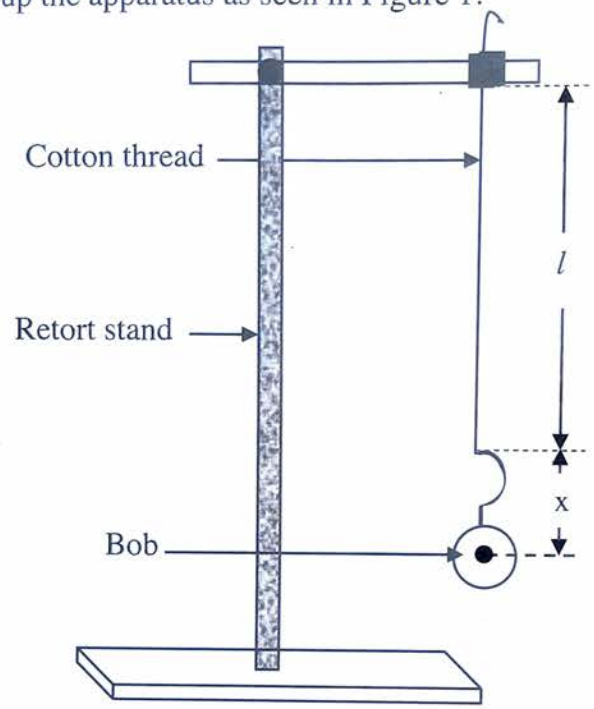


Figure 1

(b) Adjust the length (l) of the cotton thread so that l = 90 cm. Displace the pendulum bob through a small angle and then release it to oscillate. Record the time t for 20 complete oscillations.

(c) Repeat the procedures in 1 (b) for the values of l = 80 cm, 70 cm, 60 cm, 50 cm and 40 cm.

Questions

(i) Tabulate the results of l, t and t^2.

(ii) Plot the graph of l against t^2.

(iii) Determine the slope of the graph in 1 (ii).

(iv) The graph of l against t^2 is related by the equation $t^2 = \frac{4\pi^2 n^2 l}{g} + \frac{4\pi^2 n^2 x}{g}$ where x is the distance from the centre of the mass of the pendulum bob to the point at which it is tied to the cotton thread and n is the number of oscillations. Using this equation and the slope obtained in 1 (iii), estimate the acceleration due to gravity, g (cm/s^2).

(v) From your graph, determine the l-intercept in cm.

(vi) What does the value obtained in 1 (v) signify?

(25 marks)

2. You have been provided with a cell **E**, the key **K**, resistance box **R**, ammeter **A** and the voltmeter **V**. Proceed as follows:

(a) Set up the circuit as shown in Figure 2.

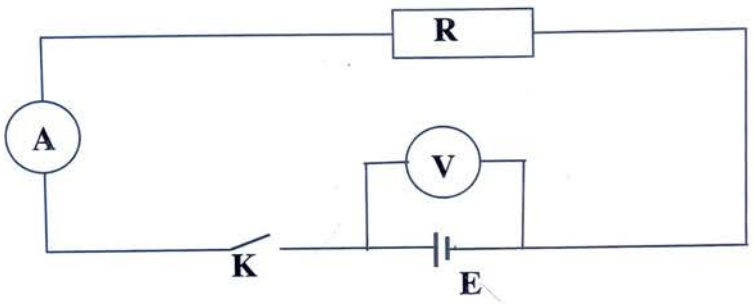


Figure 2

(b) With the key open, observe and record the reading **E** on the voltmeter.

(c) Set the resistance **R** equal to 7 Ω, close the key and then record the reading of the current I flowing through the circuit and the potential difference V across the cell.

(d) Repeat the procedure in 2 (c) with **R** = 5 Ω, 4 Ω, 2 Ω, and 1 Ω. For each case, record the corresponding values of I and V.

Questions

(i) Prepare a table of values including I (A), V (V) and (E - V) (V)

(ii) Plot a graph of (E – V) in volts against I in amperes.

(iii) Compute the slope of the graph plotted in 2 (ii).

(iv) What is the physical meaning of the slope in 2 (iii)?

(v) If a house alarm is rated 3 Ω is connected in the circuit, determine the current that must flow through the circuit alarm to operate it.

(25 marks)