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

131/3A

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

Time: 3:20 Hours **Year : 2021**

Instructions

1. This paper consists of **three (3)** questions.
2. Answer **all** questions.
3. Question **Number 1** carries **twenty (20)** marks and the other **two (2)** carry **fifteen (15)** marks each.
5. Mathematical tables and non-programmable calculators may be used.
6. Cellular phones and any unauthorized materials are **not** allowed in the examination room.
7. Write your **Examination Number** on every page of your answer booklet(s).

The following information may be useful:

Pie, $\pi = 3.14$

Acceleration due to gravity, $g = 981\ cms^{-2}$

Specific heat capacity of water, $C_w = 4.2\ J/gK$

Specific heat capacity of copper, $C_{Cu} = 0.4\ J/gK$.

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1. You are required to investigate the variation of length, L of the thread with the periodic time, T of simple pendulum.

Proceed as follows:

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

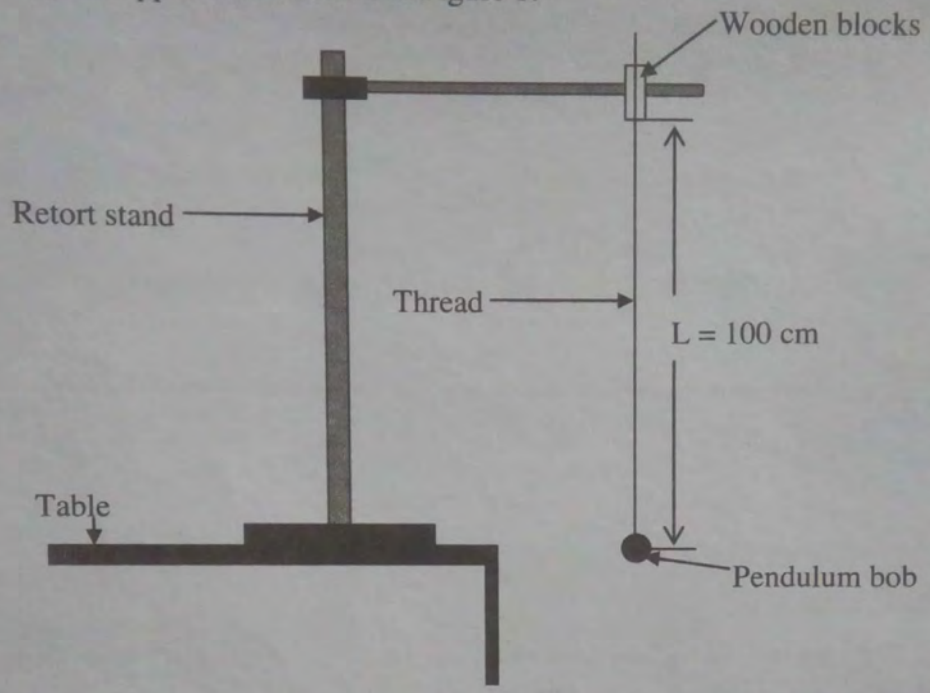

Figure 1

(b) Displace the pendulum through a small angle then release it so that it moves to and fro motion with small amplitudes. Measure and record the time, t for 10 complete oscillations and hence determine its periodic time T.

(c) Repeat the procedure in 1 (b) for the values of L = 80 cm, 50 cm, 40 cm and 15 cm.

Questions

(i) Use the dimensional analysis to find the value of n from the equation, $L = kT^n$; where k is in cms^{-1}.

(ii) Tabulate the results obtained in 1 (b) and (c) including the value of T^n.

(iii) Use the equation in 1 (i) and the results obtained in (ii) to determine the value of k graphically.

(iv) Compute the value of C, given that $C = \frac{g}{k}$ where g is the acceleration due to gravity.

(v) Determine the deviation of value of C (ΔC) from the true value.

(vi) Calculate the percentage error in performing this experiment.

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2. You are required to determine the specific heat capacity of a mass, M of a solid provided.

Proceed as follows:

(a) Measure and record the mass of a given solid M, an empty calorimeter, M_c and the room temperature θ_R.

(b) Half-fill hot water in a calorimeter then observe and record the temperature of $\theta\ ^{\circ}C$ of the water.

(c) Start with the temperature of 80 $^{\circ}C$ of hot water in the calorimeter while stirring and fanning after every one minute for about 10 minutes. Record the results.

(d) Record the mass of calorimeter with hot water; hence determine the mass, M_w of water used.

(e) Repeat the procedures in 2 (c) and (d), but in this case transfer quickly the mass, M provided to the calorimeter with water when the temperature is exactly 80 $^{\circ}C$. Record the results.

Questions

(i) On the same graph, plot the cooling curves for both experiments, then determine the highest difference in temperature ΔT between the two curves by indicating the vertical line showing the upper temperature T_1 and lower temperature T_2.

(ii) Use the equation; $M_c C_c \Delta T + M_w C_w \Delta T = M C (T_2 - \theta_R)$ to determine the specific heat capacity, C of the mass provided.

3. You are provided with resistance box, R, wire Q joined with a coiled wire in an insulator, battery, E, galvanometer, G, a jockey, J, a switch, S and connecting wires.

Proceed as follows:

(a) Connect the circuit as shown in Figure 2. Make sure that the length of the wire Q which make a loop is 60 cm.

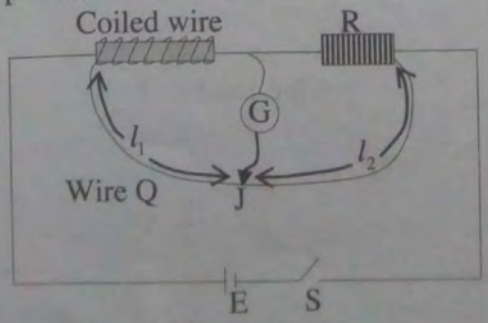

Figure 2

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(b) Set R = 2 Ω in the resistance box and close the switch to obtain the value of length l_1 and l_2.

(c) Repeat the procedure in 3 (b) by increasing R by 2 Ω each time to obtain four more readings.

Questions

(i) Tabulate the results obtained in 3 (b) and (c) including the value of $\frac{l_2}{l_1}$.

(ii) Plot a graph of R against $\frac{l_2}{l_1}$.

(iii) What is the physical meaning of the slope of the graph in 3 (ii)?

(iv) Measure the diameter of the wire Q then calculate its cross-sectional area.

(v) If the length of the coiled wire is 50 cm, find the resistivity of wire Q.

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