THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

DIPLOMA IN SECONDARY EDUCATION EXAMINATION

731/2A **PHYSICS 2A**

(ACTUAL PRACTICAL 2A)

Time: 3 Hours **Year: 2021**

Instructions

1. This paper consists of **three (3)** questions.
2. Answer **all** questions.
3. Question number **one (1)** carries **twenty (20)** marks and the rest carry **fifteen (15)** marks each.
4. Cellular phones and any unauthorized materials are not allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet (s).

1. Determine the acceleration due to gravity. You are provided instructions as follows:

(a) Tie a piece of thread to a pendulum bob.

(b) Fix the free end of the thread between the cork pads with the help of a retort stand clamps as shown in Figure 1.

(c) Ensure that the length of the thread from the fixed point to the bob is exactly 20 cm.

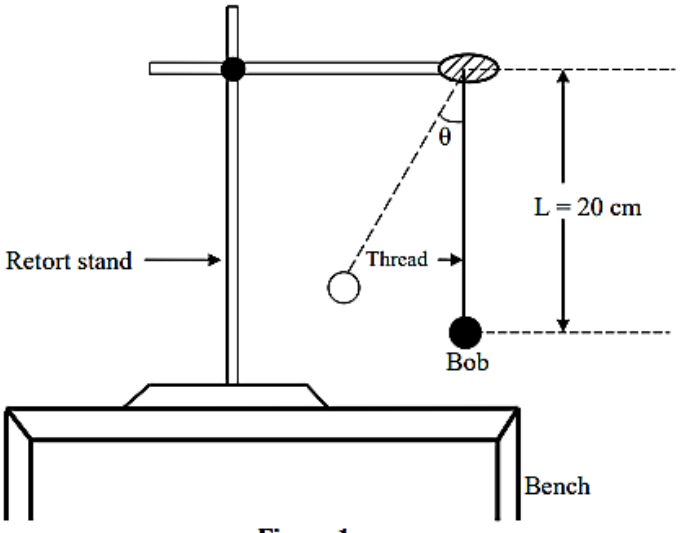

Figure 1

(d) Pull the bob aside at small angle θ and then release it such that the bob oscillates.

(e) Record the number of oscillations (n) after 5 seconds. θ L = 20 cm Retort stand Thread Bob Bench

(f) Repeat procedure (d) and (e) for time t = 10 sec, 15 sec, 20 sec, 25 sec and 30 sec.

Questions

(i) Tabulate the results obtained in 1e and 1f including the columns for log (t) and log (n).

(ii) Plot the graph of log(t) against log(n).

(iii) Deduce the relation used to plot a graph in (ii), if $t^2 = kn^2$.

(iv) Determine the value of y-intercept from the graph.

(v) Find the value of quantity 'a' from the equation: $a = -218ms^{-3} \times b$, where b is y-intercept.

(vi) Give the physical meaning of quantity 'a' found in 1(v)?

(vii) State any three sources of error.

2. Determine the specific heat capacity of a liquid labelled Q. Follow the procedures as follows:

(a) Weigh the empty calorimeter with its lid and stirrer, record as M_1

(b) Fill the calorimeter with hot liquid Q heated to 85^{o}C to about three quarters.

(c) Insert the copper calorimeter into its jacket and place on a bench, cover it with its lid and insert the thermometer. Start stopwatch and gently stir the hot liquid Q while recording the temperature after every 2 minutes. Take your readings until when liquid Q cools to about 55^{o}C. (d) Remove the thermometer and weigh the calorimeter with its contents, (liquid Q, lid and stirrer) record it as M_2

Questions

(i) Tabulate your results as shown in the following table. Time (sec) Temperature (^{o}C)

(ii) Find the mass of liquid Q, recorded as mass M_2.

(iii) Plot a graph of temperature (°C) against time for liquid Q.

(iv) Draw the tangent at the temperature of 70°C and obtain the rate of cooling

of the liquid Q.

(v) Solve for the specific heat capacity of liquid Q (CQ) using the relation:

$$(M_2C_0 + 400M_1)\frac{d\theta}{dt} = 10.096 Js^{-1}.$$

3. Determine the value of unknown resistor R on the bases of the following procedures;

(a) Connect all the components as shown in a circuit diagram in Figure 2. The voltmeter (V) and unknown resistor (R) should be connected in parallel.

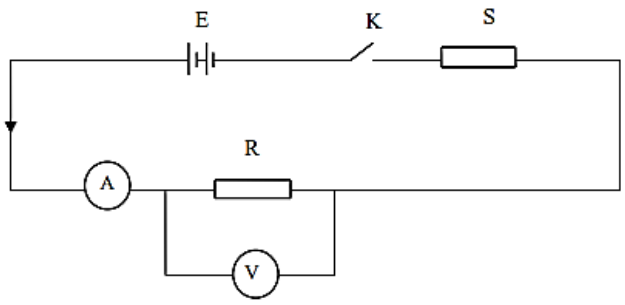

Figure 2

(b) Adjust the resistance to 15 Ω and record the readings of the ammeter and voltmeter.

(c) Repeat procedure 3(b) to obtain six more readings for resistance box tuned to 20 Ω, 25 Ω, 30 Ω, 35 Ω, 40 Ω and 45 Ω.

Questions

(i) Tabulate the results obtained in 3 (c) as shown in the following table;

S (Ω)	15	20	25	30	35	40	45
V(v)							
I(A)							

(ii) Plot the graph of voltage (V) against current (I).

(iii) Find the slope (m) of the graph.

(iv) State the SI unit of the slope found in part (iii).

(v) What physical quantity does the slope of the graph indicate?