THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL OF TANZANIA

DIPLOMA IN SECONDARY EDUCATION EXAMINATION

731/2A **PHYSICS 2A**

(ACTUAL PRACTICAL 2A)

Time: 3 Hours **Year: 2022**

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)

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1. Find the weight of the pendulum bob by using the following apparatuses: retort stand, clamps, metre rule, cotton thread, wood pads and stopwatch. Conduct an experiment through the given procedures and then answer the questions that follow.

Procedures:

(a) Set the experiment in such a way that the pendulum bob is at a height, (H) = 100 cm from the ground to the centre of the bob and a length, l of the thread be 60 cm from the point of suspension to the centre of the pendulum bob.

(b) Slightly displace the pendulum bob at a small angle and release to allow it swing and measure the time t required to complete 20 oscillations and calculate its periodic time T.

(c) Repeat the procedure in 1(b) by increasing the length of thread, l = 70 cm, 80 cm, 90 cm, 100 cm and 120 cm each time recording the values of H and t and hence its corresponding periodic time T.

(d) Finally, measure the mass m in kg of the pendulum bob, by using a beam balance.

Questions:

(i) Draw a labeled diagram of the experimental set up.

(ii) Tabulate your results, including the values of t, l, H, T and T^2 .

(iii) Plot the graph of H (cm) against T^2 (sec^2).

(iv) Determine the slope, S of your graph.

(v) Determine the weight W of the metal ball in newton, given that

$$W = \left(\frac{-0.0254}{mS} \right)^{-1}$$

(vi) Show that T^2 intercept $= \frac{4\pi^2 K}{g}$

(vii) What is the physical meaning of K?

2. Determine the specific heat capacity of block A and B. Given the following apparatuses: a copper calorimeter with its jacket, a thermometer, a stirrer, a tripod stand, a wire gauze, a beam balance, 25 ml beaker, 50 g of metal block A, 50 g of metal block B, a thread, a source of heat and water. Use the given information to perform the experiment and then answer the questions that follow.

Procedures:

(a) Fill the beaker with water to about $\frac{2}{3}$ of its volume.

(b) Measure and record the mass m_A and m_B of metal blocks A and B respectively.

(c) Tie a thread to block A, gently lower it into water in the beaker.

(d) Heat the water until it boils.

(e) Measure the mass of the calorimeter and its stirrer as m_1 . Insert the calorimeter into its jacket.

(f) Fill the calorimeter about $\frac{1}{2}$ with water and measure its mass as m_2 .

(g) Read and record the temperature of the water in the calorimeter as θ_1 . Quickly transfers block A into the calorimeter and cover with a lid.

(h) Observe the temperature while stirring the water in the calorimeter until it reaches a maximum value.

(i) Record the highest temperature of the water in the calorimeter as θ_2.

(j) Repeat the procedures in 2 (c) to (i) using the metal block B.

3. Conduct an experiment to verify whether wire Q has high conductivity or the same as that of copper. Follow the procedures provided and then answer the questions that follow.

Procedures:

(a) Connect a dry cell, an ammeter, a voltmeter, a key K and rheostat in series.

(b) Join a voltmeter across the battery terminal.

(c) With the Key K open, record the voltmeter reading.

(d) With the Key K closed, adjust the rheostat so that the ammeter pointer is at exactly 0.2 A and record its corresponding voltmeter reading in volts.

(e) Repeat procedure 3 (d) with ammeter readings of 0.4, 0.6, 0.8 and 1.0 A.

Questions

(i) Tabulate your results, including the values of I and V.

(ii) Draw a well labeled diagram for the experimental set-up.

(iii) Plot a graph of V and I.

(iv) Use your graph to determine the internal resistance and e.m.f of that dry cell and comment on your answer comparing to the value given by the factory.

(v) If the dry cell used in 3 (iv) is replaced by another dry cell an internal resistance that is twice that of the first one, what will be the magnitude of the current flowing in the circuit?