THE UNITED REPUBLIC OF TANZANIA

PRESIDENT'S OFFICE,

REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT

NJOMBE REGION

FORM SIX PRE – NATIONAL EXAMINATION

CODE: 131/3A PHYSICS 3A

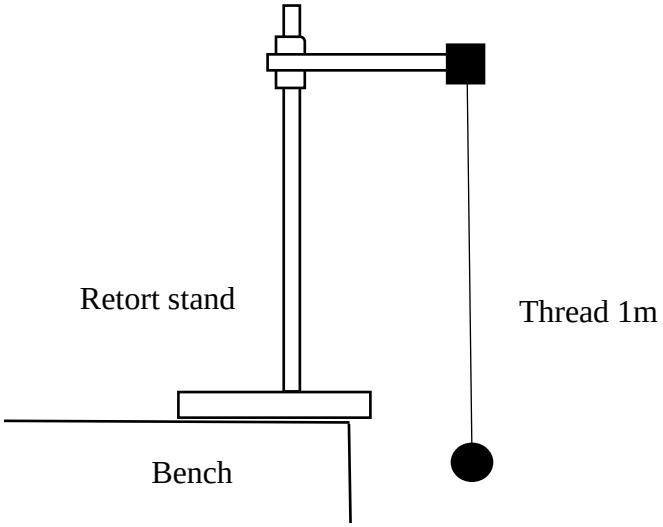
(For Both School and Private Candidates)

TIME: 03: 00 HOURS WEDNESDAY, 20TH March 2024 A.M

INSTRUCTIONS

1. This paper consists of **Three (3)** questions.
2. Answer **ALL** questions.
3. Question one carries **20 marks** and other two questions carries **15 marks** each.
4. Cellular phones and any other unauthorized materials are not allowed in examination room.
5. Write your **examination number** on every page of your answer sheets.
6. The following information may be useful:
    a) Pie=3.14

1. A form five student needs to learn about a gravitational pull of the earth, teacher assigned you as his friend to help him through experiment using the following setup provided and procedures



Measure the length, L=1m, of the thread from the point of suspension to the point of attachment of the bob, Set the bob to oscillate through a small angle. Find the time (t) for 20 complete oscillations.

By raising the thread each time, shorten the length of the pendulum by about 10 cm, 20 cm, 30 cm and 40 cm. On each occasion, find the length of the thread in meters and the corresponding time t for 20 complete oscillations.

Questions

a) Tabulate your results.
b) How L and T^2 relate in this experiment?
c) Plot the graph of L against T^2, where T is the period of the oscillations.
d) Find the slope of your graph
e) Determine the acceleration due to gravity g.
f) Determine the L-intercept from your graph and state its physical meaning.
g) What are the two possible aims of doing this experiment?
h) Mention any two sources of errors**.** **(20marks)**

2. Form five students were debating on whether the excess temperature of the surrounding affect the rate of cooling of given heated object or not. Conclude their debate by performing experiment using the following apparatuses; a calorimeter, lid, stirrer, thermometer, water bath containing hot water maintained at 90^{o}C, cardboard and stop watch.

Proceed as follows:

Fill the calorimeter with hot water about $^{3}/_{4}$ full. Put the calorimeter containing hot water on a cardboard placed over the bench. Starting with 80^{o}C, record temperature after 2 minutes' intervals. Take your readings for 20 minutes. Stir water thoroughly until the end of your experiment.

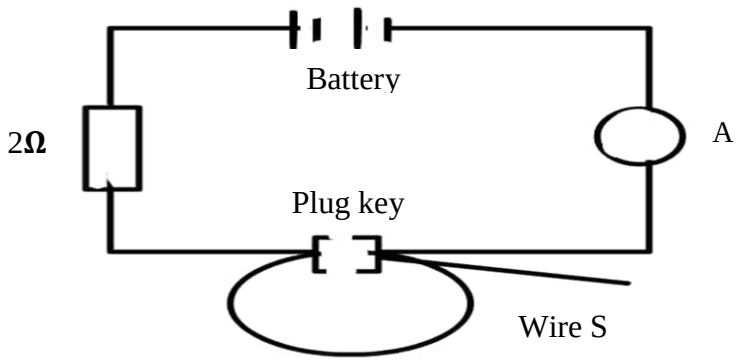
Record the room temperature at the beginning and at the end of the experiment and find the average temperature θs (°C).

Questions

a) Tabulate your results.
b) Plot a graph of $\log(\theta - \theta s)$ against time, t.
c) Given that A= $\log(\theta - \theta s)$ + Kt where A is a constant, Determine the value of K and the constant A.
d) From the graph, state the relation between the rate of loss of heat from a calorimeter and the excess temperature over its surroundings.
e) Which law does this relation obey
f) State the physical meaning of K. **(15marks)**

3. Laboratory equipment dealer wants to know from you the specifications of the wire which was not indicated. You are required to perform an experiment to obtain the required specifications of the wire using; standard resistor of 2Ω, a battery (two dry cells each of 1.5V), 110 cm wire of unknown resistivity, ammeter, switch, micrometer screw gauge, metre rule and several pieces of connecting wires.

Proceed as follows



Connect the circuit as shown in Figure above, With the plug key open adjust the length of wire S to a value of L_S=20cm Note the ammeter reading, the plug key should remain open throughout the experiment.

Repeat the procedures above for L_S =40cm, 60cm, 80cm and 100cm each time

recording the ammeter reading.

Questions

a) Tabulate your results.
b) Plot a graph of $\frac{1}{I}$ against L_S
c) Determine the slope and the $\frac{1}{I}$ intercept of the graph.
d) Measure and record the diameter of a wire
e) Using your graph, determine the resistivity ρ of the wire and internal resistance r of the battery.
f) What is the aim of performing this experiment? **(15marks)**