THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

ADVANCED CERTIFICATE OF SECONDARY EDUCATION

EXAMINATION

131/3C **PHYSICS 3C**

(ACTUAL PRACTICAL C)

(For Both School and Private candidates)

Time: 3:20 Hours **Year: 2022**

Instructions

1. This paper consists of **three (3)** questions**.**
2. Answer **all** questions.
3. Question **one (1)** carries **20** marks, and the other **two (2)** carry **15** marks each.
4. Mathematical tables and non-programmable calculators may be used.
5. All writing must be in **blue** or **black** ink **except** drawing which must be in pencil
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 folowing information may be useful:

Specific heat capacity of Water $C_w = 4.2J/gK$

Pie, $\pi = 3.14$.

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1. You are provided with a wire **W**, a meter rule, cork pads, a test tube, a micrometre screw gauge, five masses each having 10 g a retort stand with its accessories, an optical pin (pointer), a string of 20 cm, masking tape and a light plastic scale pan.

Proceed as follows:

(a) Measure and record the length, L (m) and diameter d (m) of the wire, W provided.

(b) Wind tightly the whole length of the wire on the test tube provided, making sure that turns are as close as possible but do not overlap.

(c) Remove the coil from the test tube, straighten the first and last turns of the coil made, then bend one end of the coil to make a hook.

(d) Arrange the apparatus as shown in Figure 1.

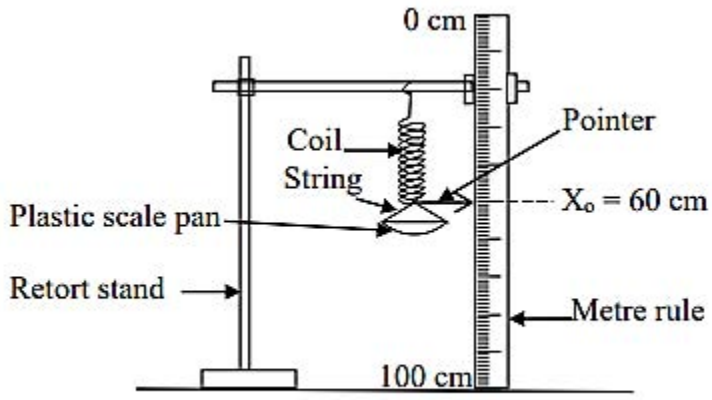


Figure 1

(e) With the help of a masking tape, insert a pointer at X_o when there is no mass placed on a plastic scale pan.

(f) Place 10 g mass on a plastic scale pan, measure the new length, X when the

spring is extended and calculate the extension.

(g) Without removing the first mass, add another mass weighing 10 g on the scale pan to make a total of 20 g and measure the new length and calculate its extension.

(h) Repeat the procedure in 1 (g) by adding 10 g mass until you get a total mass of 50 g while measuring new length and extension in each case.

Questions

(i) Tabulate your results including the values of load as F (N) and extension, e (m), where; 100 g = 1 N.

(ii) Plot a graph of extension (m) against load (N).

(iii) Give comment on the relationship between the load and extension in 1 (ii).

(iv) Determine the slope, K of the graph.

(v) Use the value obtained in 1 (iv) to calculate the value of ρ from the equation, $K = \frac{4L}{\pi d^2 \rho}$

(vi) What is the physical meaning of the value obtained in 1 (v)?

2. You provided with the following information: A hotel with ten floors and 100 rooms has installed a solar heater at the top of the building. Copper pipes were used for distributing heated water from the heater to bathrooms. However, it has been noticed that there was a temperature drop as water flows from the heater to the outlets in the bathrooms.

Proceed as follows:

(a) Pour hot water into the calorimeter so that it is $\frac{3}{4}$ full and set the apparati as shown in Figure 2.

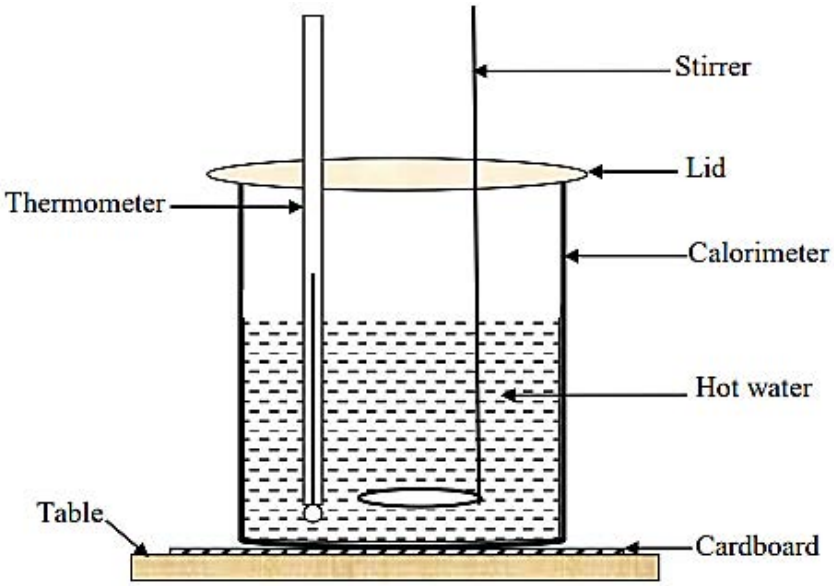


Figure 2

(b) Record the room temperature, θ_R.

(c) While stirring start with the temperature 65°C in the calorimeter, record the temperature θ of water in the calorimeter as it cools at an interval of 2 minutes for 16 minutes.

Questions

(i) Record your results in a tabular form including the values of $(\theta - \theta_R)$ and $\log(\theta - \theta_R)$.

(ii) Plot the graph of $\log(\theta - \theta_R)$ against time, (t) in minutes.

(iii) Relate the slope of a graph plotted in (ii) to the water flowing from the heater to the outlet in the bath rooms.

(iv) Deduce the temperature of the surroundings, θ_S from the equation, $\theta_S = 65 - \log^{-1} C$ where, C is the vertical intercept of the graph.

(v) What can you conclude on the values of room temperature, θ_R and surrounding temperature, θ_S obtained in this experiment?

3. You are given a series that a car manufacturing industry used electroplating technique to paint car parts whereby a selected part of the body of a car becomes one electrode and the second electrode was a selected metal. In order to paint these parts, the resistance of the electrodes must be known before introducing a current through them. You are provided with an aluminium foil (30 cm × 2 cm), 1 Ω standard resistor, resistance box, dry cell, switch and two crocodile clips.

Proceed as follows:

(a) Connect the meter bridge circuit in a usual manner with the aluminium foil in parallel with the given 1 Ω standard resistor. Use crocodile clips to fix the foil

in its position. The resistance box should be connected in a right hand gap of the meter bridge.

(b) With the resistance box set at R = 5 Ω, close the switch, K and find the balancing length, L on the bridge wire on the side where aluminium foil is fixed.

(c) Repeat the procedure in 3(b) for the values of R = 4 Ω, 3 Ω, 2 Ω and 1 Ω.

Questions

(i) Draw a circuit diagram of your experimental set up.

(ii) Tabulate your results including the values of $\frac{1}{L}$

(iii) Derive the equation governing this experiment.

(iv) Plot a graph of $\frac{1}{L}\left(m^{-1}\right)$ against R (Ω).

(v) Determine the gradient of the graph in (iv).

(vi) Estimate the resistance of aluminium sheet of the surface area of $30m^2$ to be used as an electrode.