THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

DIPLOMA IN SECONDARY EDUCATION EXAMINATION

731/2B **PHYSICS 2B**

(ACTUAL PRACTICAL 2B)

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 unathorized 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. Carry out an experiment through the given procedures to find the total mass of the spring.

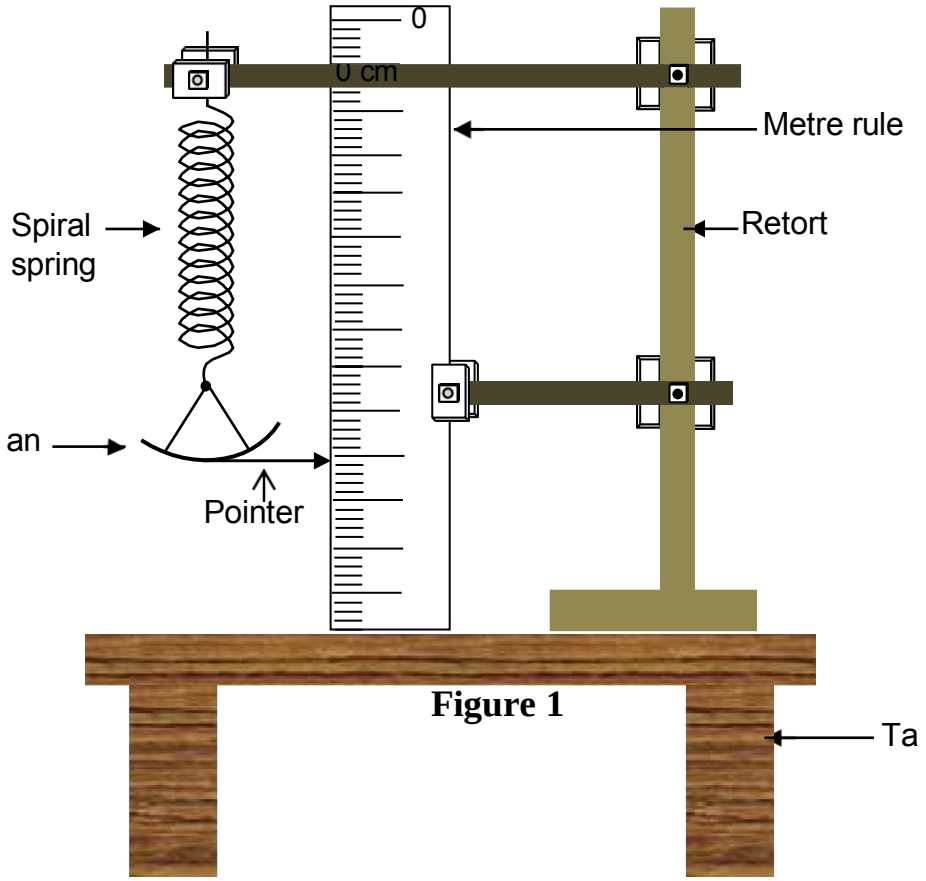

Figure 1

Procedures:

(a) Record the pointer's reading when the pan is empty as Xo (cm).

(b) Put 100 g mass on a pan and record a new pointer's reading as X (cm). Hence find the extension, $S = X - X_0$

(c) Pull a spring to a small distance and release it so that it oscillates in a vertical motion. Record time t in seconds for 20 complete oscillations.

(d) Repeat the procedure in 1 (c) for masses, 200 g, 250 g, 300 g, 350 g and 400 g.

Questions

(i) Tabulate your results, including the values of m (g), t (sec), T (sec) and T^2 (sec^2).

(ii) Plot a graph of m (g) against T^2 (sec^2).

(iii) Using the equation (m m), $T^2 = \frac{4\pi^2}{K}(m + m_{es})$, calculate the effective mass (mes) of the spring where $K = \frac{0.98N}{S(cm)}$.

(iv) What is the physical meaning of constant K?

(v) Use y-intercept of the graph to determine the value of the effective mass of the spring mes .

(vi) Using effective mass obtained in 1 (v), write down the relationship between mass of the spring (mS) and mes , and hence use the relation to solve for mS.

(vii) What will be the total mass of the spring loaded over the digital balance?

2. Perform an experiment to investigate the capacity of the liquids to absorb the amount of heat from the running metal parts per kilogram per degree rise in temperature. Use the procedures provided and then answer the questions that follow.

Procedures:

(a) Weigh an empty calorimeter with its stirrer and lid as m_C.

(b) Fill $\frac{3}{4}$ of the calorimeter with hot liquid, A which is about 70°C.

(c) Put the calorimeter with its contents into the jacket and cover it with lid.

(d) While stirring gently, record the temperature of the liquid at an interval of 2 minutes until the liquid cool to the temperature of about 45°C.

(e) Remove the calorimeter with its contents from the jacket, measure and record its mass with stirrer and lid as m_{CA} .

(f) Repeat the procedures in 2 (a) to (d) with liquid B, measure and record the mass of the calorimeter with its contents, stirrer and lid as m_{CB}

Questions

(i) Tabulate your results.

(ii) Plot the cooling curve for liquid A and B on the same axis.

(iii) Obtain the gradient at 60°C for each liquid from the graph plotted in 2 (ii).

(iv) Deduce the equation governing this experiment.

(v) Determine the specific heat capacity of liquid B given that the specific heat capacity of liquid, A, CA = 4200 J/kg K and the specific heat capacity of calorimeter, C = 400 J/kg K.

(vi) Compare the specific heat capacities of the two liquids and explain why one of the liquids is more suitable to be used as a cooling agent in a car radiator than the other.

(vii) What is the aim of doing this experiment?

3. Conduct an experiment to determine the resistance of the resistor Q from the following procedures:

Procedures**:**

(a) Connect resistor Q, resistance box, two dry cells and a switch in series to complete a circuit. Then connect a 0 – 5 V voltmeter across the resistance box.

(b) Read the voltmeter and record the value of V when a resistor of 2 Ω is set on the resistance box.

(c) Repeat the procedure in 3 (b) by setting a resistance box in such a way that R = 4 Ω, 6 Ω, 8 Ω and 10 Ω to obtain a total of four other readings.

Questions

(i) Draw the circuit diagram you connected as per instructions given

(ii) Tabulate your results including the columns for $\frac{1}{V}$ and $\frac{1}{R}$

(iii) Plot a graph of $\frac{1}{V}$ against $\frac{1}{R}$.

(iv) Using a graph and the equation $V = \left(\frac{R}{Q+R}\right)E$, determine the values of resistor Q and e.m.f of the dry cells.

(v) (v) If an electrical engineer used another method to determine the value of resistor Q and got 5 Ω, would the value be recommended to replace the damaged resistor? Justify your answer.