P510/3
PHYSICS
(Practical)
Paper 3
July/Aug. 2022
3 ¼ hours

ASK INTERGRATED TEACHERS' MOCK EXAMINATIONS BURREAU

AITEL JOINT MOCK EXAMINATIONS

Uganda Advanced Certificate of Education

PHYSICS

(PRACTICAL)

Paper 3

3 Hours 15 Minutes

INSTRUCTIONS TO CANDIDATES:

Answer **Question 1** *and* **one** *other question.*
Any additional question will **not** *be marked.*
Candidates are **not** *allowed to use the apparatus for the* **first 15 minutes.**
Graph papers are provided.
Non-programmable scientific electronic calculators may be used.
Candidates are expected to record on their scripts all their observations as these observations are made and to plan the presentation of the records so that it is ***not*** *necessary to make a fair copy of them. The working of the answers is to be handed in. Details on the question paper should* ***not*** *be repeated in the answer* ***nor*** *is the theory of the experiments required unless specifically asked for. Candidates should, however record any special precautions they have taken and any particular feature of the method of going about the experiments.*
Marks are given mainly for a clear record of the observations actually made, for their suitability, accuracy and for the use made of them.

1. In this experiment you will determine the constant *a* and young's modulus of the material of a bicycle spoke. **(34 marks)**

PART 1

(a) Measure the mass **M** of the bicycle spoke.

(b) Suspend the bicycle spoke provided horizontally using two pieces of thread as shown in figure 1.

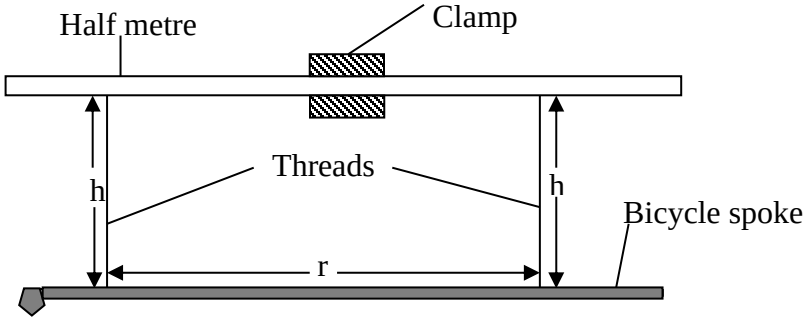

Fig. 1

(c) Adjust the pieces of thread such that the distance ***r*** between them is 20.0cm and they are equidistant from the centre of the spoke.

(d) Keeping the pieces of thread parallel, adjust them so that the length ***h*** = 0.150m.

(e) Displace the ends of the spoke horizontally through a small angle about the vertical axis.

(f) Measure the time for 20 oscillations.

(g) Determine the period **T**

(h) Repeat procedures (c) to (e) for values of ***h* = 0.200, 0.250, 0.300, 0.350 and 0.400m.**

(i) Tabulate your results including values T^2.

(j) Plot a graph of T^2 against *h***.**

(k) Determine the slope, S of the graph.

(l) Calculate the constant, ***a*** from the expression,

$$\mathbf{S=\frac{16\pi^2 a}{Mgr^2}}$$ Where **g** = 9.81ms^{-2}.

PART II

(a) Measure and record the diameter, ***d*** of the bicycle spoke provided.

(b) Clamp the spoke horizontally between two pieces of wood with a length ***l*** = 20.0cm projecting from the edge of the table.

(c) Attach a pointer to a paper clip and using a piece of thread, suspend it 1.0cm from the free end of the spoke as shown in figure 2.

(d) Clamp a metre rule vertically and place it next to the pointer on the metre rule

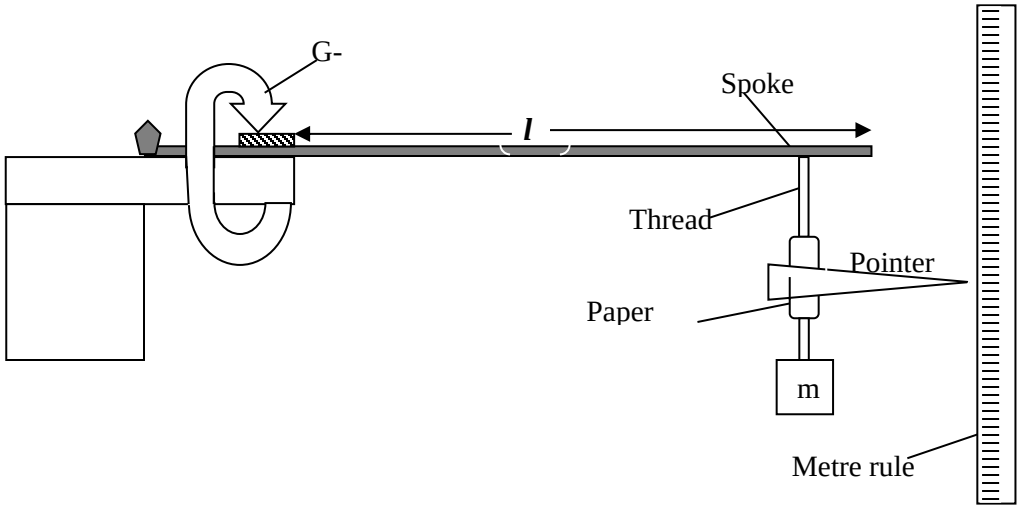

Fig. 2

(e)Read and record the position of the pointer on the metre rule.

(f) Suspend a mass, ***m*** = 100g from the paper clip.

(g) Read and record the new position of the pointer on the metre rule.

(h) Determine the depression, ***x*** of the spoke.

(i) Calculate young's modulus **E** from the expression

$$E=\frac{32gl^3m}{3\pi d^4x}$$

2. In this experiment you will determine the focal length of a concave lens using two methods. **(33marks)**

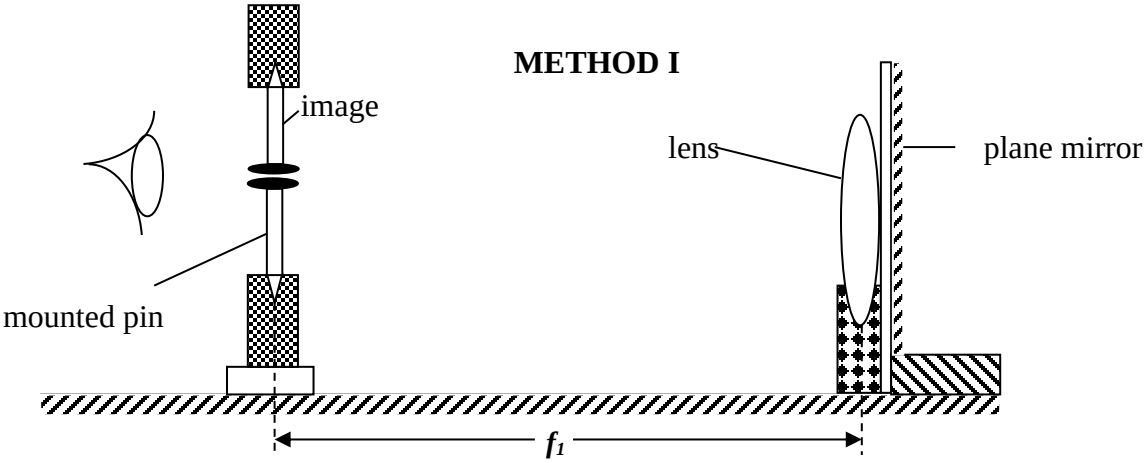

Fig. 3

(a) Arrange the mounted pin, converging lens and the plane mirror as shown in fig. **3**.

(b) Adjust the position of the pin until its image appears to coincide with it.

(c) Measure and record the distance, $\mathbf{f_1}$ between the lens and the pin.

METHOD II

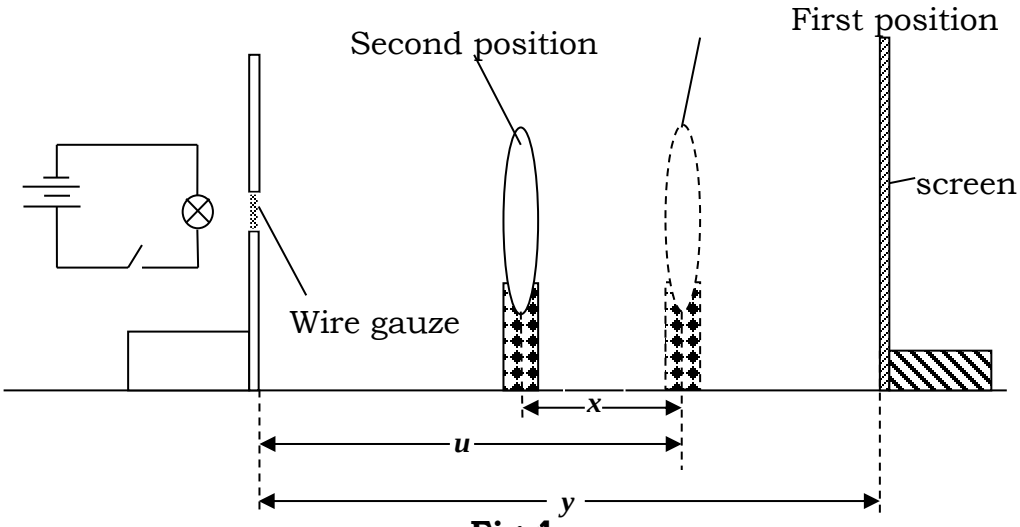

Fig.4

(a) Connect the torch bulb in series with the dry cells and switch, k.
(b) Set up the arrangement shown in fig. 3.
(c) Adjust the position of the lens such that the distance u = 40.0 cm.
(d) Adjust the position of the screen until a clear image of the gauze is obtained on it.
(e) Measure and record the distance, ***y*** between the two screens.
(f) Without changing the position of the screens, displace the lens so that another clear image of the wire gauze is formed on the screen.
(g) Measure and record the distance, ***x*** between the two positions of the lens.
(h) Repeat procedures (c) to (g) for values of ***u = 50.0, 60.0, 65.0, 70.0*** *and* ***80.0 cm***.

(i) Tabulate your results including values of x^2 and $\frac{x^2}{y}$.

(j) Plot a graph of $\frac{x^2}{y}$ against ***y***.

(k) Read and record the intercepts, C_1 on the vertical axis and C_2 on the horizontal axis.

(l) Calculate f_2 from the expression $f_2 = \frac{1}{8}(C_2 - C_1)$

3. In this experiment you will determine the resistivity of the material of a wire. **(33 marks)**

(a) Record the value $\mathbf{R_q}$ of the resistor marked *Q*.

(b) Measure and record the length x_0 and diameter, *d* of the exposed part of the wire labeled *S*.

(c) Connect the circuit in figure 5.

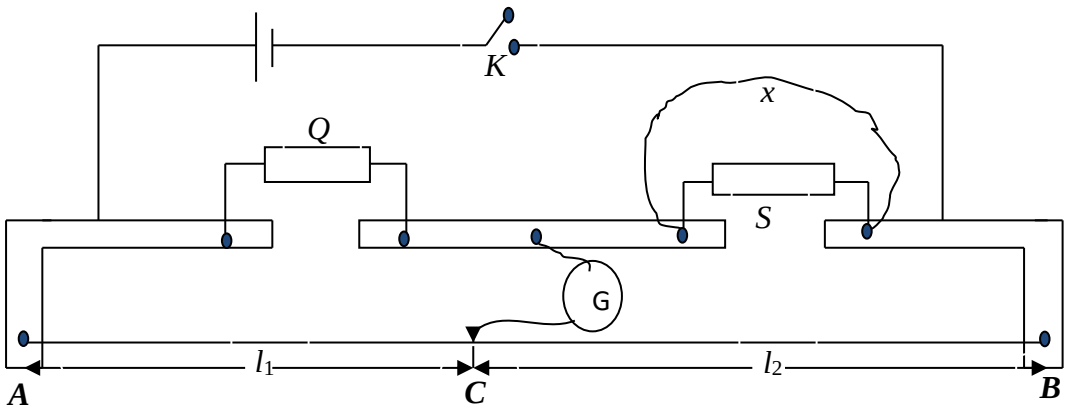

Figure 5

(d) Connect the full length (both the exposed and concealed portion) of the wire labeled **S** across the right-hand gap.

(e) Move the sliding contact C along the metre bridge wire AB until the galvanometer shows no deflection.

(f) Measure and record the balance length **AC** = $\boldsymbol{l_0}$.

(g) Connect the full length x_0 of the exposed part of the wire in parallel with the concealed part across the right-hand gap.

(h) Move the sliding contact C along the metre bridge wire **AB** until the galvanometer shows no deflection.

(i) Measure and record the balance lengths $\boldsymbol{l_1}$ and $\boldsymbol{l_2}$.

(j) Repeat procedures (f) and (g) for $\boldsymbol{x = 0.8x_0}$, $\boldsymbol{0.6x_0}$, $\boldsymbol{0.5x_0}$, $\boldsymbol{0.4x_0}$ and $\boldsymbol{0.2x_0}$.

(k) Record your results in a suitable table including values of $\frac{\mathbf{1}}{\mathbf{x}}$ and $\frac{l_1}{l_2}$

(l) Plot a graph of $\frac{\mathbf{1}}{\mathbf{x}}$ against $\frac{l_1}{l_2}$.

(m) Find the slope $\boldsymbol{\beta}$ of the graph.

(n) Determine intercept **C** on the $\frac{1}{x}$- axis.

(o) Calculate **r** from the expression

$$\mathbf{r_1}\ \frac{\boldsymbol{\pi d^2 \beta R_q}}{\mathbf{4}}$$

$$\mathbf{r_2} = \frac{\mathbf{(100-c)R_q d^2}}{\mathbf{4cy}}, \text{ where } \mathbf{y} = \frac{\mathbf{1}}{\mathbf{c}} + \mathbf{x_o}$$

(p) Calculate $\frac{\mathbf{2(r_2 - r_1)}}{\mathbf{(r_1 + r_2)}}$

END