UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Certificate of Education

PHYSICS
(PRACTICAL)

Paper 3

2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

Answer Question 1 and **one** *other question.*

Any additional question answered will **not** *be marked.*

For each question, candidates will be required to select apparatus from the equipment provided.

You are **not** *allowed to start working with the apparatus for the* **first quarter** *of an hour.*

Marks are given mainly for a clear record of the observation actually made, for their suitability and accuracy and for the use made of them.

Candidates are reminded to record their observations as soon as they are made.

Where possible, candidates should put their observations and calculations in a suitable table drawn in advance.

All your work must be in **blue** *or* **black** *ink. Any work done in pencil will* **not** *be marked.*

An account of the method of carrying out the experiment is **not** *required.*

Squared paper is provided.

Mathematical tables and silent non-programmable calculators may be used.

Turn Over

1. In this experiment, you will determine a property, η, of the bicycle spoke provided. (20 marks)

(a) Measure and record the height, L, of the beaker provided.

(b) Mark a ring round the midpoint of the bicycle spoke using a marker or a pen.

(c) Adjust the position of the clamp to be at a position $H = 45.0$ cm above the surface of the table.

(d) Clamp the metre rule vertically such that its base rests on the surface of the table and close to the beaker.

(e) Using a piece of thread and the retort stand, suspend the bicycle spoke as shown in figure 1.
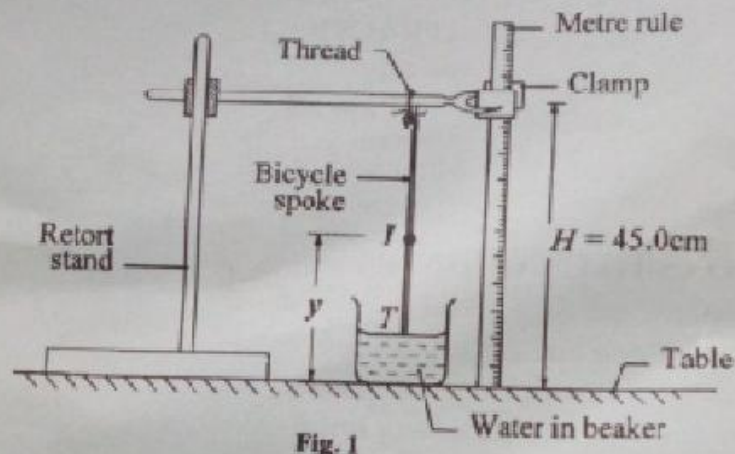

Fig. 1

(f) Pour a volume, $V = 50$ cm^3 of water into the beaker.

(g) Adjust the free end of the thread until the end, T, of the bicycle spoke just touches the surface of the water inside the beaker.

(h) Read and record the height, y, of the ink mark, I, above the surface of the table.

(i) Repeat procedure (f) to (h) for values of $V = 100.0$, 150.0, 200.0, 250.0 and 300.0 cm^3.

(j) Record your results in a suitable table including values of $\frac{y}{L}$ and $\frac{V}{L}$.

(k) Plot a graph of $\frac{y}{L}$ (along the vertical axis) against $\frac{V}{L}$ (along the horizontal axis).

(l) Find the slope, S, of the graph.

(m) Read and record the intercept, C, on the $\frac{y}{L}$ axis.

(n) Calculate the property, η of the bicycle spoke using the expression:

$$\eta = \frac{2LC}{SA}$$

where $A = 38.5$ cm^2.

DISMANTLE THE SET UP OF THE APPARATUS

3. In this experiment, you will determine the resistance R and the constant, a of the bare wire, W provided.
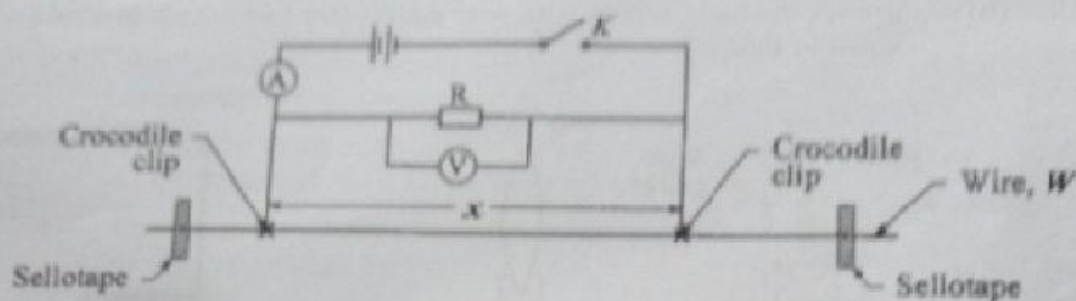
(20 marks)

(a) Connect the circuit shown in figure 3.

Fig. 3

(b) Adjust the value of x to 0.900 m.

(c) Close switch K.

(d) Read and record the readings, I, of the ammeter and, V, of the voltmeter.

(e) Open switch, K.

(f) Repeat procedure (b) to (e) for values of $x = 0.800, 0.700, 0.600, 0.500$ and 0.400 m.

(g) Tabulate your results including values of $\frac{1}{x}$ and $\frac{I}{V}$.

(h) Plot a graph of $\frac{I}{V}$ (along the vertical axis) against $\frac{1}{x}$ (along the horizontal axis).

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

(j) Read and record the intercept, C, on the $\frac{I}{V}$ - axis.

(k) Calculate, a from the expression;

$$S = \frac{1}{a}.$$

(l) Calculate, R, from the expression;

$$C = \frac{1}{R}.$$

DISMANTLE THE SET UP OF THE APPARATUS

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END

2. In this experiment, you will determine the constant, β, of the converging lens provided.
   (20 marks)

   (a) Connect a pair of dry cells, a torch bulb and a switch K in series.

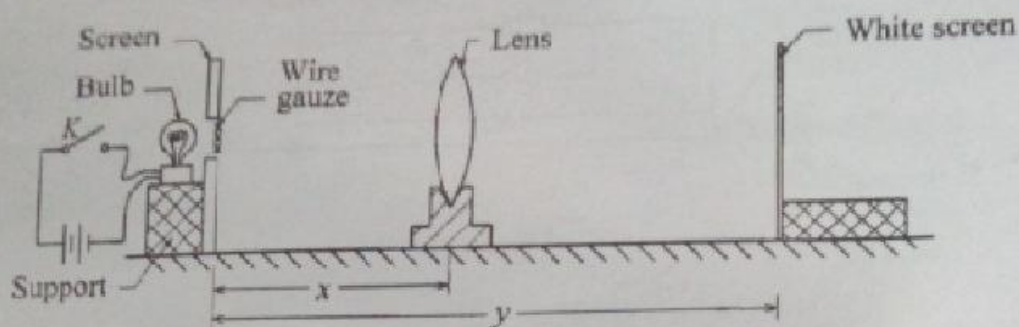   (b) Arrange the bulb, screen with wire gauze, lens and the white screen as shown in figure 2.

Fig. 2

   (c) Adjust the position of the lens so that the distance, x, between the wire gauze and the lens is 20.0 cm.

   (d) Close switch, K.

   (e) Adjust the position of the white screen until a clear image of the wire gauze is obtained on it.

   (f) Measure and record the distance, y, between the wire gauze and the white screen.

   (g) Open switch, K.

   (h) Repeat procedure (c) to (g) for values of $x = 25.0, 30.0, 35.0, 40.0$ and 45.0 cm.

   (i) Record your results in a suitable table including values of x^2 and $\dfrac{x^2}{y}$.

   (j) Plot a graph of x (along the vertical axis) against $\dfrac{x^2}{y}$ (along the horizontal axis).

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

   (l) Find the intercept, C, on the x-axis.

   (m) Calculate β using the expression;

   $$\beta = CS.$$

DISMANTLE THE SET UP OF THE APPARATUS