P510/3
PRACTICAL
PHYSICS
Paper 3
December, 2020
3¼ hours

JINJA JOINT EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

MOCK EXAMINATIONS – DECEMBER, 2020

PHYSICS PRACTICAL

(PRINCIPAL SUBJECT)

Paper 3

3 hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

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

Candidates are not allowed to use the apparatus or write for the first fifteen minutes.
Graph papers are provided.
Mathematical tables and non – programmable silent electronic calculators may be used.
Write on one side of the paper only.
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 experiment required unless specifically asked for.*

Candidates should, however, record any special precautions that they have taken and any particular features of their method of going about the experiment.

 Turn Over

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

1. In this experiment, you will determine the acceleration, g due to gravity.

PART I

(a) Measure and record the length, l and the breadth, b of the metre rule.
(b) Balance the metre rule on a knife edge and locate the point, **C** at which it balances.
(c) Suspend a mass $m = 0.100$ kg from the 10.0 cm mark of the metre rule using one of the shorter pieces of thread.
(d) Using the second shorter piece of thread, suspend the metre rule from a retort clamp and adjust the position of the thread such that the metre rule balances horizontally as shown in the figure 1.1.

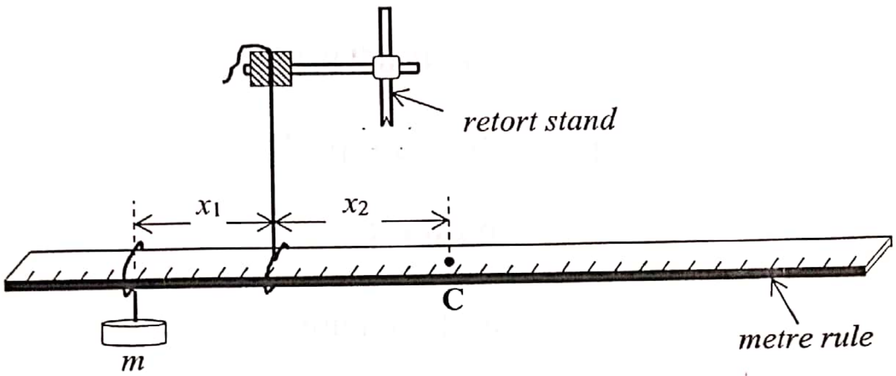


Fig. 1.1

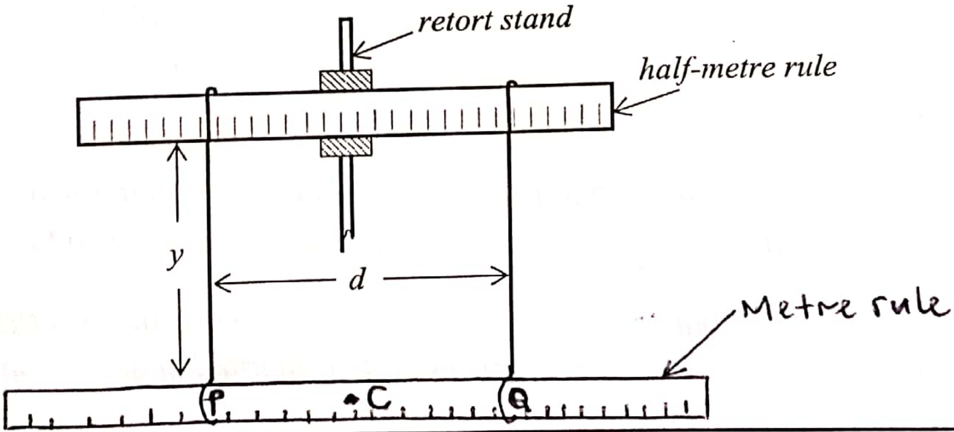
(e) Measure and record the distances x_1 and x_2.
(f) Calculate the values of θ and K from the expressions:

$$\theta = \frac{mx_1}{x_2}$$

$$K = 8.3\times10^{-2}\theta(l^2 + b^2)$$

PART II

(a) Suspend the metre rule with its graduated face upwards from a clamped half-metre rule as shown in the figure 1.2.



(b) Adjust the length, y of the threads to 0.500 m.

(c) Adjust the separation, $d = 0.200$ m of the threads such that the points P and Q are equidistant from point C of the metre rule.

(d) Set the metre rule to oscillate in a horizontal plane by turning it through a small angle about point **C** and releasing it.

(e) Measure and record the time, t for 20 complete oscillations.

(f) Find the periodic time, **T**.

(g) Repeat procedures (c) to (f) for values of $d = 0.240, 0.280, 0.320, 0.360$ and 0.400 m.

(h) Tabulate your results including values of T^2 and $\frac{1}{d^2}$.

(i) Plot a graph of T^2 against $\frac{1}{d^2}$.

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

(k) Calculate the value of **g** from the expression:

$$g = \frac{1.6\times10^2\, yK}{S\theta}$$

2. In this experiment, you will determine the constant, ⍁ of the converging lens provided.

(a) Arrange your apparatus in a straight line as shown in figure 2.1.

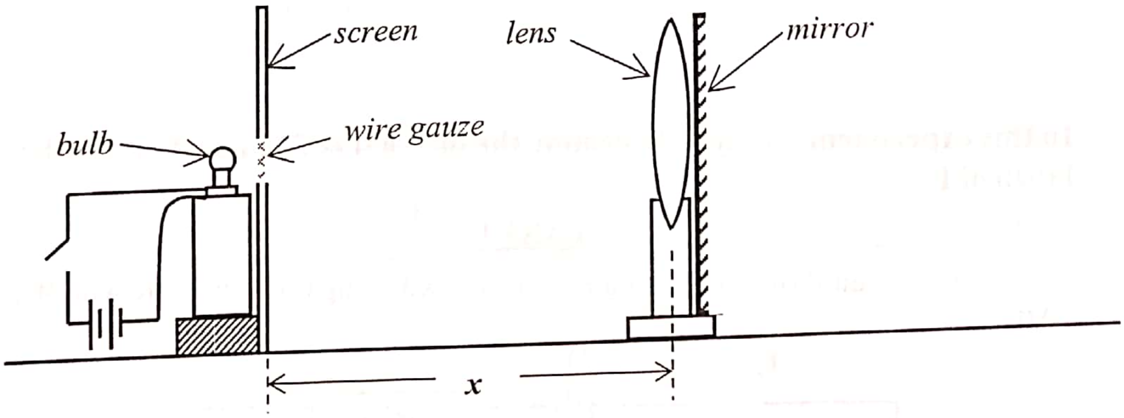


Fig. 2.1

(b) Close the switch and move the lens together with the mirror to and fro the screen until a sharp distinct image of the wire gauze is formed beside the wire gauze on the screen.

(c) Measure and record the distance, x between the screen and the lens.

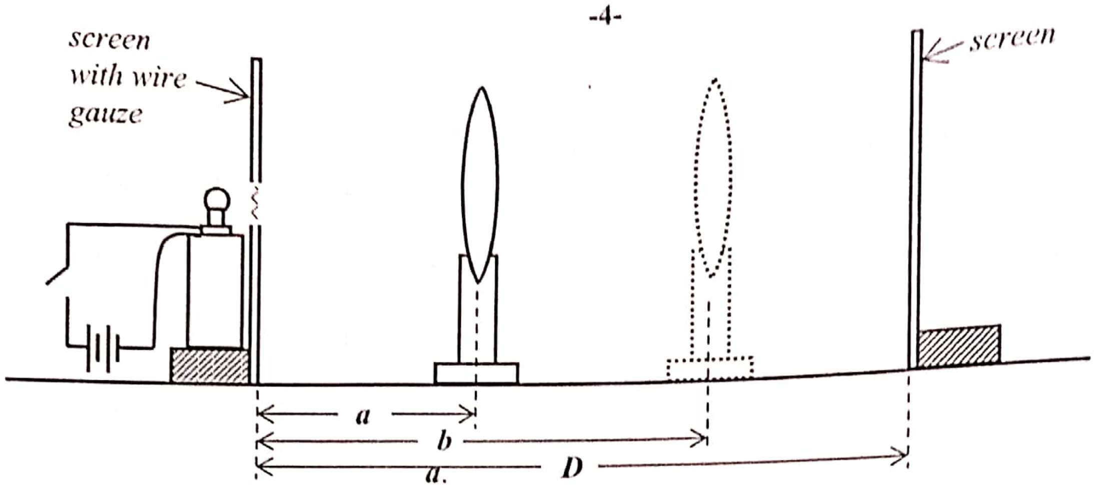


Fig. 2.2

(d) Arrange the apparatus in a straight line as shown in figure 2.2 with the separation, D of the screens equal to 90.0 cm.

(e) Move the lens near the screen with wire gauze to obtain a sharp magnified image of the gauze on the screen on the right.

(*f*) Measure and record distance

(g) Keeping the distance, D between the screens fixed, move the lens towards the screen to obtain a sharp diminished image on the screen.

(h) Measure and record distance, b.

(*i*) Repeat procedures (a) to (e) for values of D = 85.0, 80.0, 75.0, 70.0 and 65.0 cm.

(j) Tabulate your results including values of $\frac{d^2}{D}$, where $d = (b - a)$.

(k) Plot a graph of $\frac{d^2}{D}$ against D.

(*i*) Read and record the intercept, C on the D–axis.

(m) Calculate the constant, θ of the converging lens from the expression:

$$\theta = x + \frac{C}{4}$$

3. **In this experiment you will determine the internal resistance, *r*, of the dry cell labelled E.**

PART I

(a) Connect the circuit shown in the figure 3.1 below with length x of the bare wire W equal to 50.0 cm.

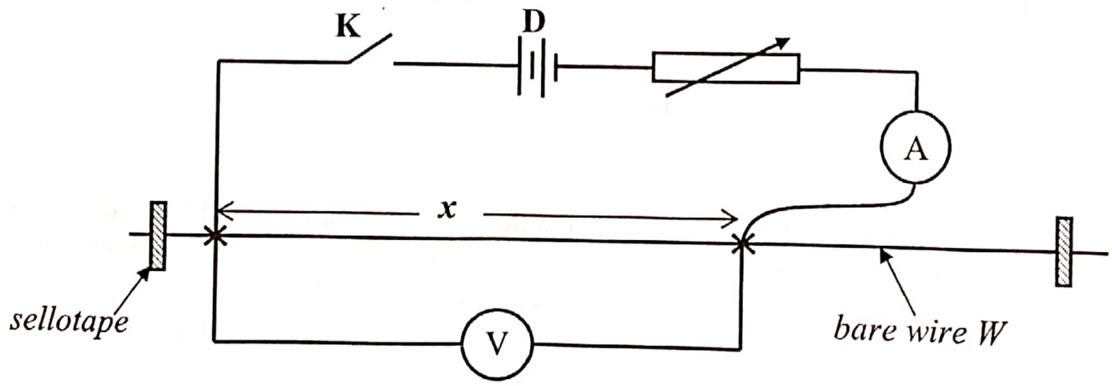


Fig. 3.1

(b) Close the switch **K** and adjust the rheostat until the ammeter indicates a current I_1 equal to 0.40 A.

(c) Read and record the voltmeter reading, V_1.

(d) Adjust the rheostat until the ammeter indicates a current I_2 equal to 0.20 A.

(e) Read and record the voltmeter reading, V_2.

(*f*) Open the switch **K**.

(g) Calculate the values of r_1 and r_2 from the expressions:

$$r_1 = \frac{V_1}{I_1 x} \quad , \quad r_2 = \frac{V_2}{I_2 x}$$

PART II

(a) Connect the circuit as shown in the figure 3.2 below with the length, $y = 0.300$m.

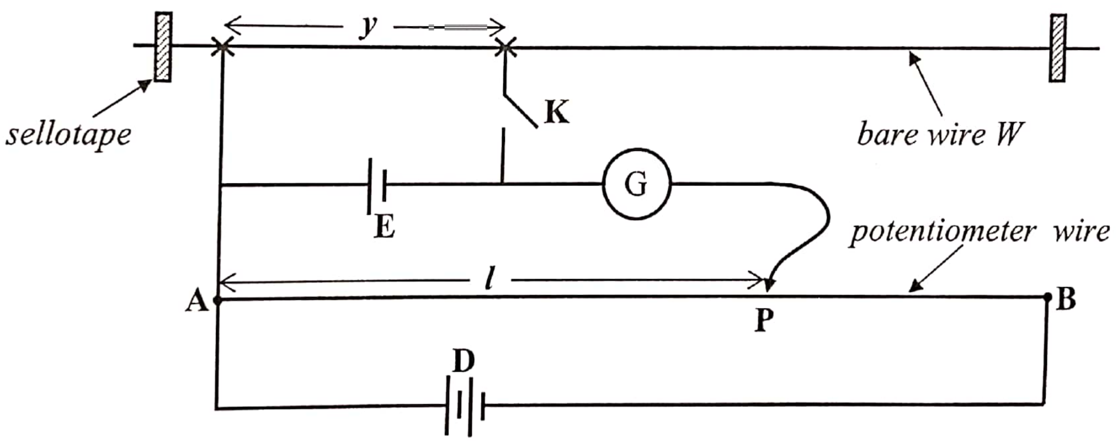


Fig. 3.2

(b) With switch K open, locate the point **P** on the potentiometer wire AB for which the galvanometer shows zero deflection.

(c) Read and record the balance length, l_1 in metres.

(d) Close switch **K**.

(e) Locate the new balance point, **P** on the potentiometer wire AB.

(f) Read and record the new balance length, l_2 in metres.

(g) Open switch **K**.

(h) Repeat procedures (d) to (g) for values of y = 0.400, 0.500, 0.600, 0.700 and 0.800 m.

(*i*) Record your results in a suitable table including the values of $\frac{1}{y}$ and $\frac{l_1}{l_2}$.

(j) Plot a graph of $\frac{l_1}{l_2}$ against $\frac{1}{y}$.

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

(*l*) Calculate the value of ***r*** from the expression:

$$r = \frac{S(r_1 + r_2)}{2}$$

 End.