P525/3
PHYSICS
(PRACTICAL)
Paper 3
July/August 2015
$3^{1}/_{4}$ hours

U.A.C.E. MOCK EXAMINATIONS, 2015

Uganda Advanced Certificate of Education

PRACTICAL PHYSICS

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 scientific 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 they have taken and any particular feature of their method of going about the experiment.

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 constant K and mass M_0 of the metre rule provided.**

Part I

(a) Balance the metre rule on a knife edge provided and note the point G where it balances.

(b) Measure and record the distance $\boldsymbol{l_0}$of G from the zero-cm mark.

(c) Place a mass m_1 = 0.050 kg mass at the 2cm mark of the metre rule and adjust the position of the knife edge until the metre rule balances horizontally as shown in figure 1 below.

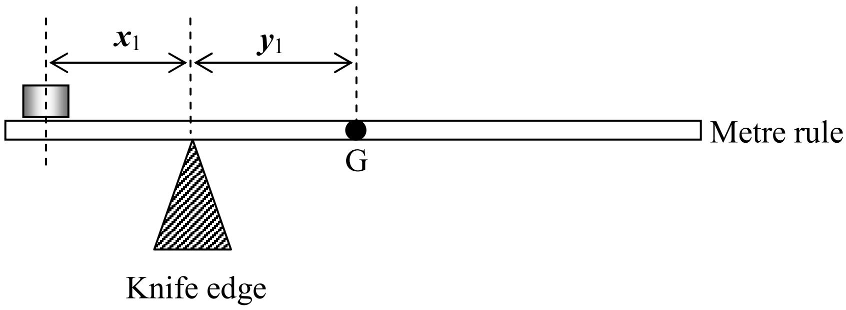

Fig. 1

(d) Measure and record the distances $\boldsymbol{x}_1$ and $\boldsymbol{y}_1$.

(e) Repeat procedures (c) and (d) for mass m_2 = 0.100 kg and measure the distances $\boldsymbol{x}_2$ and $\boldsymbol{y}_2$ respectively of m_2 and G from the knife edge.

(f) Calculate the mass M_0 of the metre rule from the expression:

$$M_0 = \frac{1}{2}\left(\frac{m_1 x_1}{y_1} + \frac{m_2 x_2}{y_2}\right)$$

Part II

(a) Measure and record the breadth $\boldsymbol{b}$ and the thickness $\boldsymbol{d}$ of the metre rule provided.

(b) Clamp the metre rule between the wooden block provided and the table such that $\boldsymbol{l}$ = 95.0 cm, and attach a pointer at end X using a piece of cellotapeas shown in figure 2 below.

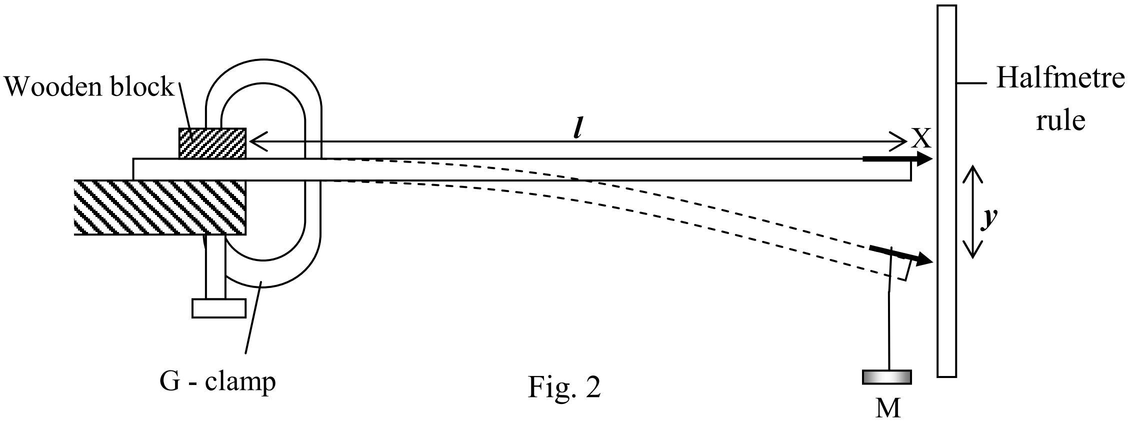

Fig. 2

(b) Clamp the half-metre rule vertically next to end X of the metre rule.

(c) Read and record the initial position of the pointer.

(d) Suspend a mass M = 0.020 kg from the end X of the metre rule using a piece of thread.

(e) Read and record the new position of the pointer and determine the depression ***y*** in metres.

(f) Repeat procedures (c) to (e) for values of M = 0.050, 0.070, 0.100, 0.120 and 0.150 kg.

(g) Record your results in a suitable.

(h) Plot a graph of ***y*** against M.

(i) Read and record the intercept **C** on the ***y*** axis.

(j) Determine the slope ***s*** of the graph.

(k) Calculate the constant K of the metre rule from the expression:

$$\boldsymbol{s} = \frac{4l^3 \mathrm{g}}{\mathrm{K}bd^3}$$

where g = 9.81 ms^{-2}.

(l) Calculate the mass M_0 of the metre rule from the expression:

$$\mathbf{C} = 0.375\, M_0 \boldsymbol{s}$$

2. **In this experiment, you will determine the constant k of the convex lens provided using two methods.**

Part I

(a) Arrange the convex lens and the mounted optical pins as shown in fig. 3 below.

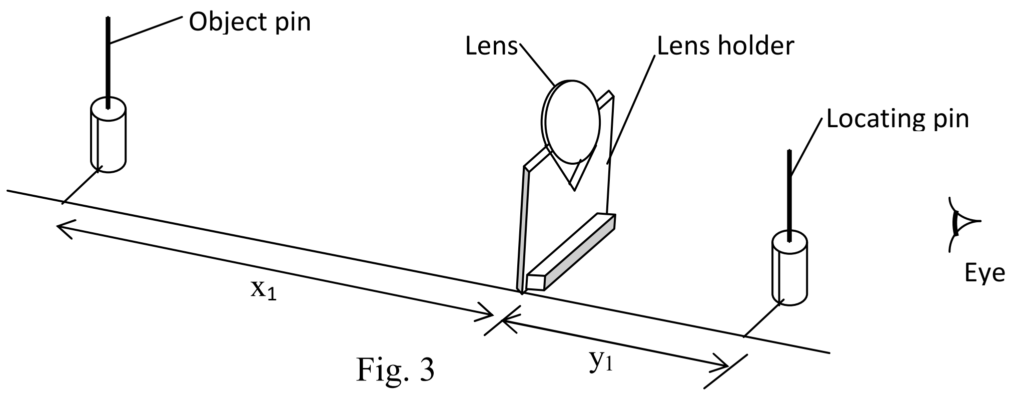

Fig. 3

(b) Adjust the distance between the object pin and the lens to $x_1 = 45.0$ cm.

(c) With the aid of the locating pin, locate the position of the image of the object pin by the method of no parallax.

(d) Measure and record the distance y_1.

(e) Repeat procedures (b) to (d) for values of $x_2 = 30.0$ cm and obtain the corresponding image distance y_2.

(f) Calculate $k = \frac{1}{2}\left(\frac{x_1 y_1}{x_1+y_1} + \frac{x_2 y_2}{x_2+y_2}\right)$

Part II

(a) Set up the screen and the convex lens as shown in figure 4 below.

(b) Clamp the half metre rule horizontally with the graduated side facing you at a distance of about 2.0 cm from the lens.

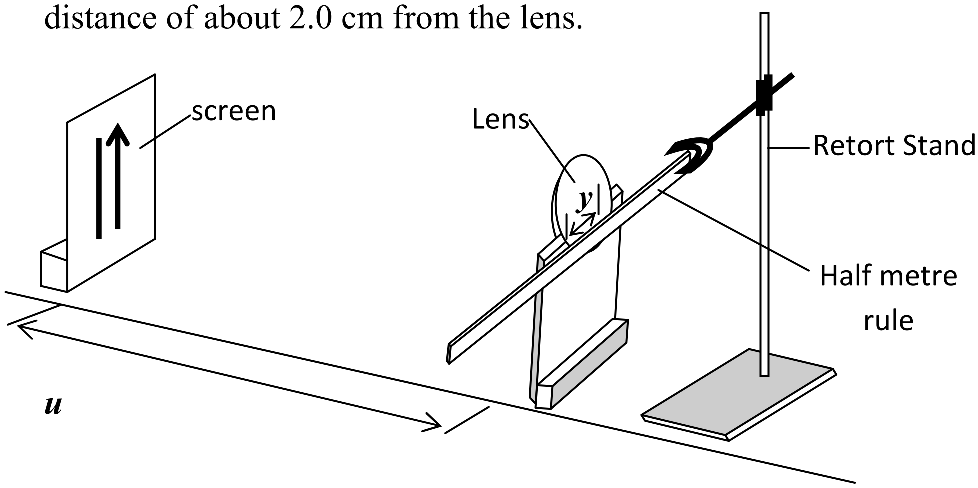

Fig. 4

(c) Move the screen towards the lens until the distance $\boldsymbol{u}$ = 5.0 cm.

(d) Look through the lens at the bold lines drawn on the screen.

(e) Move your head away from the lens until you see the bold lines clearly.

(f) Measure and record the distance $\boldsymbol{y}$ between the bold lines as seen from the half metre rule.

(g) Repeat procedures (c) to (f) for $\boldsymbol{u}$ = 6.0, 7.0, 8.0, 9.0, 10.0, 11.0 and 12.0 cm respectively.

(h) Tabulate our results to include values of $\frac{1}{y}$.

(i) Plot a graph of $\frac{1}{y}$ against $\boldsymbol{u}$.

(j) Find the slope $\boldsymbol{s}$ of the graph.

(k) Find $\mathbf{k} = \frac{1}{s}$.

3. In this experiment you will determine the internal resistance, r, of a dry cell using two methods.

PART I

a) Set up the circuit as shown in figure 5 below.

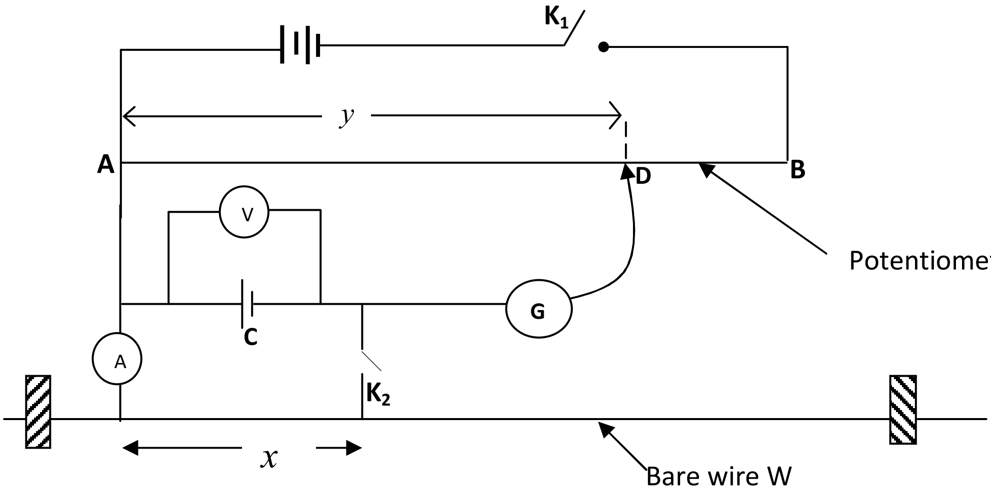

Fig. 5

b) Close switch, K_1.
c) Move the sliding contact along the potentiometer slide wire until a point is found where the galvanometer, **G**, shows no deflection.
d) Measure and record the balance length, ***l***.
e) Open switch, K_1.
f) With x = 0.500 m, close the switches K_1 and K_2
g) Move the sliding contact along the potentiometer slide wire until a point is found where the galvanometer, **G**, shows no deflection.
h) Measure and record the balance length, y.
i) Record the readings **V** and **I** of the voltmeter and ammeter respectively.
j) Open switch, K_1 and K_2.
k) Calculate the internal resistance of a dry cell from the expression:

$$\mathbf{r} = \frac{V(l-y)}{Iy}$$

PART II

a) Set up the circuit as shown in figure 6 below.

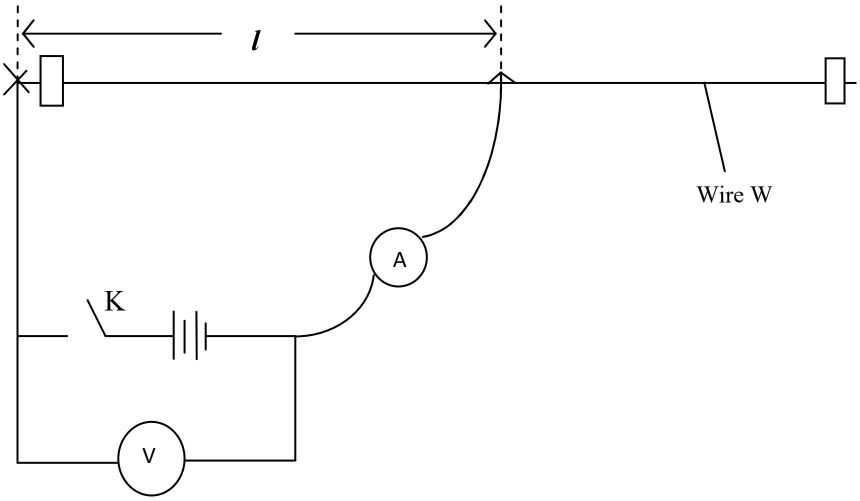

Fig. 6

b) Starting with l= 1.000 m, close switch **K**.

c) Record the readings **V** and **I** of the voltmeter and ammeter respectively.

d) Open switch, K

e) Repeat procedures (b) to (c) for values of l = 0.900, 0.800, 0.700, 0.600, 0.500, 0.400, 0.300, 0.002 and 0.100m.

f) Tabulate your results including values of **VI**and $\frac{V}{I}$.

g) Plot a graph of**VI**against$\frac{V}{I}$.

h) Findthe value, **R**, of $\frac{V}{I}$ when **VI** is maximum.

i) Comment on the values of **r** and **R**.

END