UNEB UACE PHYSICS PAPER 3 2018

1. In this experiment, you will determine a property, # of half – meter rule provided by two methods.

METHOD I

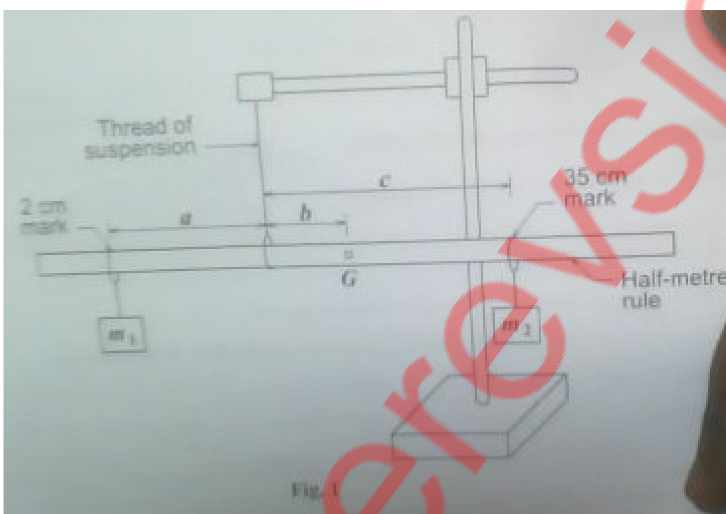
a) Balance the half-meter rule provided horizontally on a knife edge.

b) Read and record the balance point g

c) Suspend the half –meter rule from the retort stand clamp with its scale facing upwards using a piece of thread.

d) Suspend a mass m_1 = 0.050kg from the 2.0cm mark of the half-meter rule.

e) Suspend a mass m_2 =0.020kg from the opposite side of the thread of suspension at the 35.0cm mark of the half – meter rule as shown in figure 1.



f) Adjust the position of the thread of suspension of the half meter rule until it balances horizontally.

g) Measure and record the distances a ,b and c

h) Leave the set-up undisturbed

i) Calculate the value of , #1 from the expression;

f) Adjust the position of the thread of suspension of the half-meter rule until it balances horizontally.

g) Measure and record the distances a, b and c

h) Leave the set-up undisturbed.

i) Calculate the value of,#1 from the expression;

$$\gamma_1 = \frac{5a - 2c}{100b}$$

METHOD II

a) Attach a pointer to one end of the spiral spring using masking tape.

b) Remove the masses m_1 and m_2 from the half-meter rule in the set-up you used in method I.

c) Suspend the spring from 2.0cm mark of the half-meter rule using a piece of thread.

d) Adjust the position of the thread of suspension of the half – meter rule until it balances as shown in figure 2

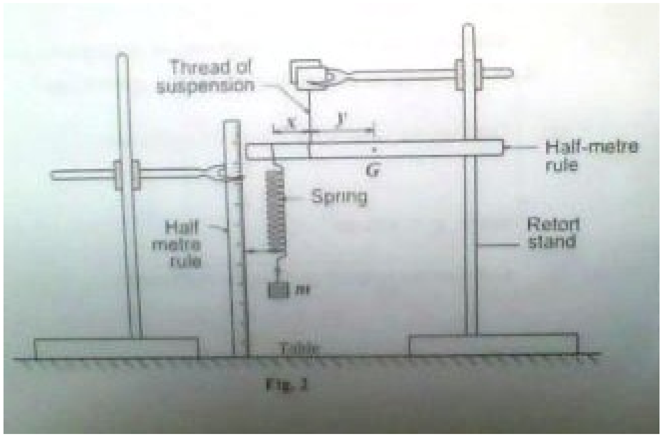


Fig. 2

e) Clamp the second half – meter rule vertically and move it near the pointer.

f) Read and record in meters the initial pointer position P_0

g) Suspend a mass m= 0.050kg from the lower end of the spring and adjust the position of the thread of suspension of the half-meter rule until it balances horizontally.

h) Read and record in meters the new pointer position, P_1

i) Read and record the distances x and y

j) Calculate the extension, e, of the spring meters

k) Repeat the procedure (g) to (j) for values of m= 0.100, 0.150. 0.200, 0.250 and 0.300kg

l) Record your results in a suitable table including values of $\frac{y}{x}$

m) Plot a graph of e against $\frac{y}{x}$

n) Find the slope, S, of the graph.

o) Calculate the value of k from the expression;

$$k = \frac{mg}{e_1}$$

k = where e_1 is the value of the extension, e corresponding to mass m= 0.300kg in your table of results and g = 9.81 ms^{-2}

p) Calculate the value of, #2 from the expression;

$$\gamma_2 \frac{Sk}{g}$$

where g= 9.81ms^{-2}

q) Calculate the value of # from the expression

$$\gamma = \frac{1}{2}(\gamma_1 + \gamma_2)$$

2. In this experiment, you will determine the property, #, of the glass block provided.

a) Fix a plain sheet of white paper on a soft board using drawing pins

b) Place the glass block centrally on the sheet of paper with its largest face uppermost.

c) Trace the outline of the glass block ABCD, as shown in figure 3

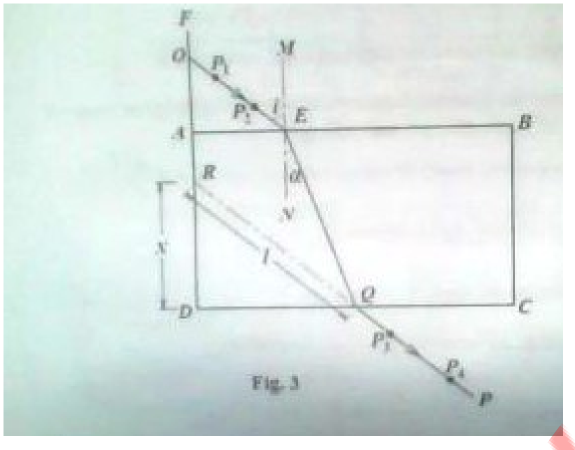


Fig. 3

d) Remove the glass bock

e) Extend DA to a point F about 7cm from A

f) Draw a normal, MN at E, a distance about ¼ AB

g) Draw a line OE at angle i= 15^0 to the normal MN

h) Replace the glass block on its outline

i) Fix pins P_1 and P_2 vertically along line OE

j) While looking through the glass block from side DC, fix pins P_3 and P_4 such that they appear to be in line with the images of P1 and P2

k) Remove the glass block and the pins

l) Draw a line through P_3 and P_4 to meet DC at Q and produce PQ to meet DF at R

m) Join Q to E

n) Measure and record the distances x and l and angle #

o) Replace the glass block and repeat procedure (g) to (n) for values of I = 25^0, 35^0, 45^0, 55^0 and 65^0.

p) Tabulate your results including values of $\sin^2$ # and $\frac{x^2}{l^2}$

r) Determine the slope, S, of the graph

s) Calculate the value of $\#_1$, from the expression

$$\beta_1 = \sqrt{\frac{-1}{S}}$$

t) Read and record the intercept, C, on the $\sin^2$# –axis

u) Calculate the value of $\#_2$, from the expression

$$\beta_2 = \sqrt{\frac{1}{C}}$$

v) Find the value of the constant, #, from the expression;

$2\# = (\#_1 + \#_2)$

(Tracing is handed in together with the script)

3. In this experiment, you will determine a constant, # of the wire labeled, W

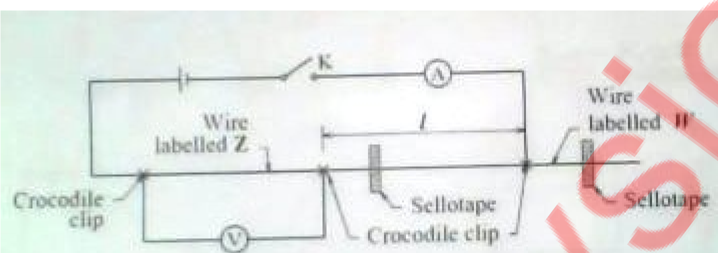


Fig. 4

a) Connect the circuit shown in figure 4 such that length, l , of the bare wire W = 0.100m. Make sure that that the length of wire Z connected is 0.500m.

b) Close switch, K

c) Read and record the ammeter reading I_1 and the voltmeter reading V_1

d) Repeat procedure (a) and (b) for $l = 0.500m$

e) Read and record the ammeter reading I2 and voltmeter reading V_2

f) Repeat procedure (a) to (b) for l =0.700m

g) Read and record the ammeter reading I_3 and voltmeter reading V_3

h) Find the resistance, R, of Z from the expression,

$$R = \frac{1}{3}\left[\frac{V_1}{I_1} + \frac{V_2}{I_2} + \frac{V_3}{I_3}\right]$$

DISMANTLE THE APPARATUS

PART II

a) Measure and record, in meters, the diameter, d, of the wire labeled W

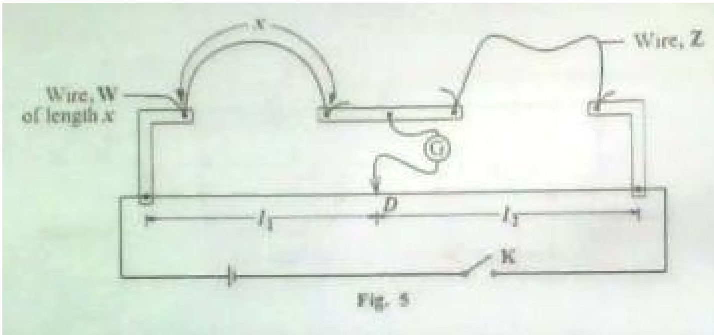


Fig. 5

b) Connect the circuit as shown in figure 5. Make sure that the length of Z connected is 0.500m

c) Starting with a length x = 0.200m of wire, W, close switch K

d) Move the sliding contact along the bridge wire to a point D where the galvanometer shows no deflection.

e) Read and record the balance length, l_1 and l_2

f) Open switch K.

g) Repeat procedure (c) to (f) for values of x = 0.300, 0.400, 0.500, 0.600 and 0.700m

h) Record your results in a suitable table including values of and

i) Plot a graph of Rx against x

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

k) Calculate the constant, #, from the expression

DISMANTLE THE APPARATUS

PART II

a) Measure and record, in meters, the diameter, d, of the wire labeled W

image

b) Connect the circuit as shown in figure 5. Make sure that the length of Z connected is 0.500m

c) Starting with a length x = 0.200m of wire, W, close switch K

d) Move the sliding contact along the bridge wire to a point D where the galvanometer shows no deflection.

e) Read and record the balance length, l_1 and l_2

f) Open switch K.

g) Repeat procedure (c) to (f) for values of x = 0.300, 0.400, 0.500, 0.600 and 0.700m

h) Record your results in a suitable table including values of

$$\frac{l_1}{l_2} \text{ and } R_x = R\frac{l_1}{l_2}$$

i) Plot a graph of R_x against x

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

k) Calculate the constant, #, from the expression

$$\frac{1}{S} = \frac{\pi d^2}{4\alpha}$$

DISMANTLE THE APPARATUS