P510/3
PHYSICS PRACTICAL
Paper 3
3 1/4 hours

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S.6 MOCK 1 EXAMINATIONS 2016
PHYSICS PRACTICAL
PAPER 3

3 HOURS 15 MINUTES

INSTRUCTIONS TO CANDIDATES:

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

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

Candidates are **not** allowed to use the apparatus for the **first fifteen minutes**.

Graph papers are provided.

Mathematical tables and 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 for 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 paper **should not** be repeated in the answer, **nor** is the theory of the experiments required unless specifically asked for.

However candidates should record any special precautions they have taken and any particular features 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 acceleration due to gravity, g by three methods.** **(34 marks)**

METHOD I

a) Tie the pendulum bob at the end of the second longest thread.

b) Suspend the pendulum bob as shown in ***figure 1*** by clamping the end of the thread using two small pieces of wooden blocks such that length $l_0 = 90.0$ cm.

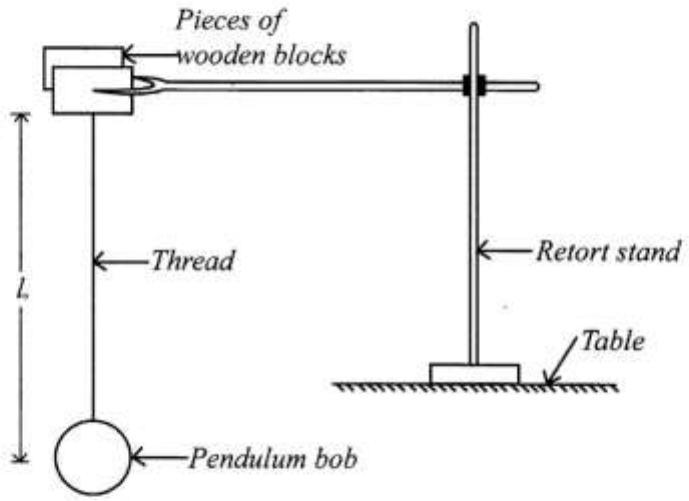

Figure 1

c) Displace the pendulum bob slightly and release it to oscillate.

d) Measure and record the time, t for 20 oscillations.

e) Calculate period T_0

f) Calculate the value of g_1 from the expression: $g_1 = \frac{4\Pi^2 l_0}{T_0^2}$ where $\Pi = 3.14$

METHODS II AND III

a) Clamp a metre rule with the graduated face towards you.

b) Make two loops of the longest thread at A and B such that the length L_1 of the thread ACB is equal to 80.0 cm.

c) Adjust the loops of thread such that the distance d from A to B is equal to 70.0 cm.

d) Using the shortest thread, suspend a simple pendulum CD of length L_2 = 15.0 cm from the mid-point C of the thread ACB as shown in ***figure 2***.

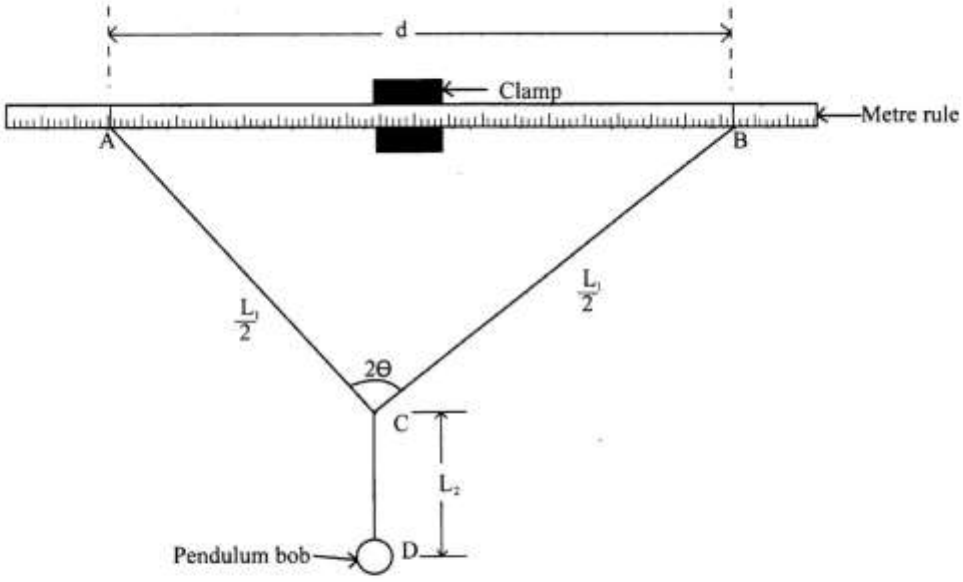

Figure 2

e) Measure and record angle 2θ.

f) Displace the pendulum through a small angle so that it oscillates in a vertical plane, normal to ACB.

g) Measure and record the time for 20 oscillations.

h) Calculate the period T.

i) Repeat procedures (c) to (h) for values of d = 60.0, 50.0, 40.0, 30.0 and 20.0cm.

j) Record your results in a suitable table including values of cosθ and T^2

k) Plot a graph of T^2 against cosθ.

l) Determine the slope S of the graph.

m) Read and record the intercept K_0 on the T^2 – axis.

n) Calculate the value of g_2 from the expression: $S = \frac{2\Pi^2 L_1}{g_2}$

where $\Pi = 3.14$

(o) Calculate the value of g_3 from the expression: $K_0 = \frac{4\Pi^2 L_2}{g_3}$

(p) Calculate the value of acceleration due to gravity, **g** from the expression:

$$g = \frac{(g_1+g_2+g_3)}{3}$$

2. In this experiment, you will determine the refractive index, n of the material of the glass block provided by two methods. **(33 marks)**

METHOD I

(a) Fix a plain sheet of paper on the soft board using drawing pins.

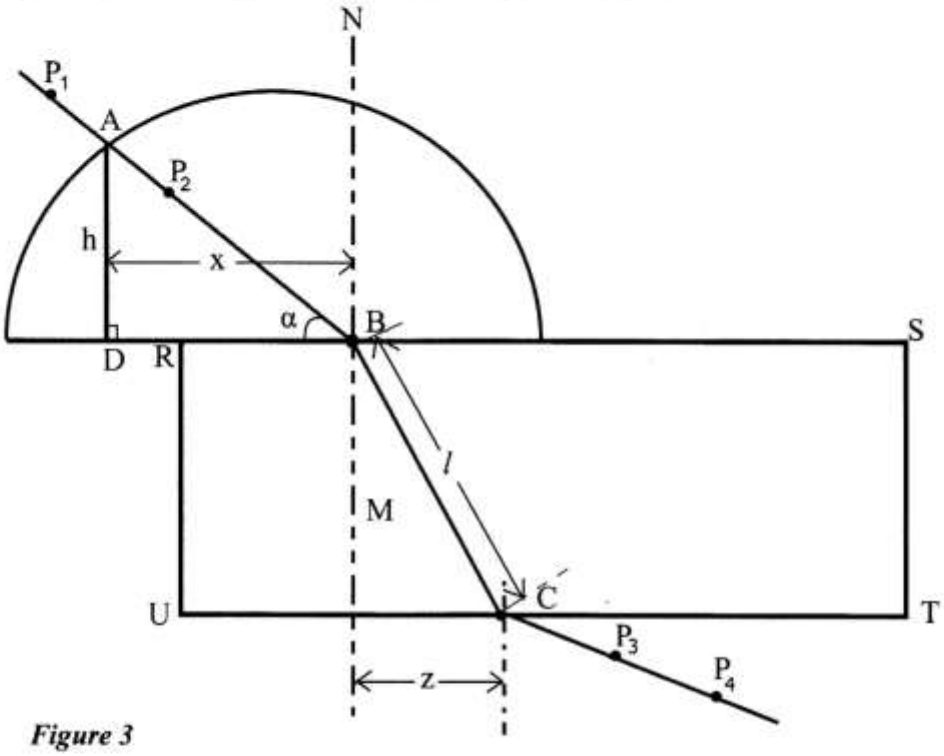

Figure 3

(b) Place the glass block on plain sheet of paper with its largest face upper most.

(c) Trace its outline and label the outline as RSTU.

(d) Draw the normal NM at B such that $RB = \frac{1}{4}(RS)$.

(e) Draw a semi circle of radius 4.0cm and centre B.

(f) Draw a radius AB such that angle $\alpha = 10^0$ as shown in the ***figure 3***.

(g) Put back the glass block on its outline.

(h) Fix pins P_1 and P_2 vertically along AB.

(i) While looking though the glass block side UT, fix pins P_3 and P_4 such that they appear to be in line with the images of P_1 and P_2

(j) Remove the glass block and the pins.

(k) Draw a line through P_3 and P_4 to meet UT at C.

(l) Join C to B. Draw a normal to line RS at D through A.

(m) Measure and record distances: x, h, z and l.

(n) Repeat procedures (f) to (m) for values of

$\alpha = 15^\circ, 20^\circ, 25^\circ, 30^\circ$ and 35°.

(o) Record your results in a suitable table including values of $x\sin\alpha$ and $\frac{hz}{l}$

(p) Plot a graph of $x\sin\alpha$ against $\frac{hz}{l}$

(q) Determine the slope $\mathbf{n_1}$ of the graph.

METHOD II

a) Measure and record the breadth **w** of the glass block.

b) Fix the second plain sheet of paper on the soft board using drawing pins.

c) Place the glass block on the plain sheet of paper and trace its outline ABCD.

d) Remove the glass block.

e) Draw a normal MN at Q, 3.0cm from end A.

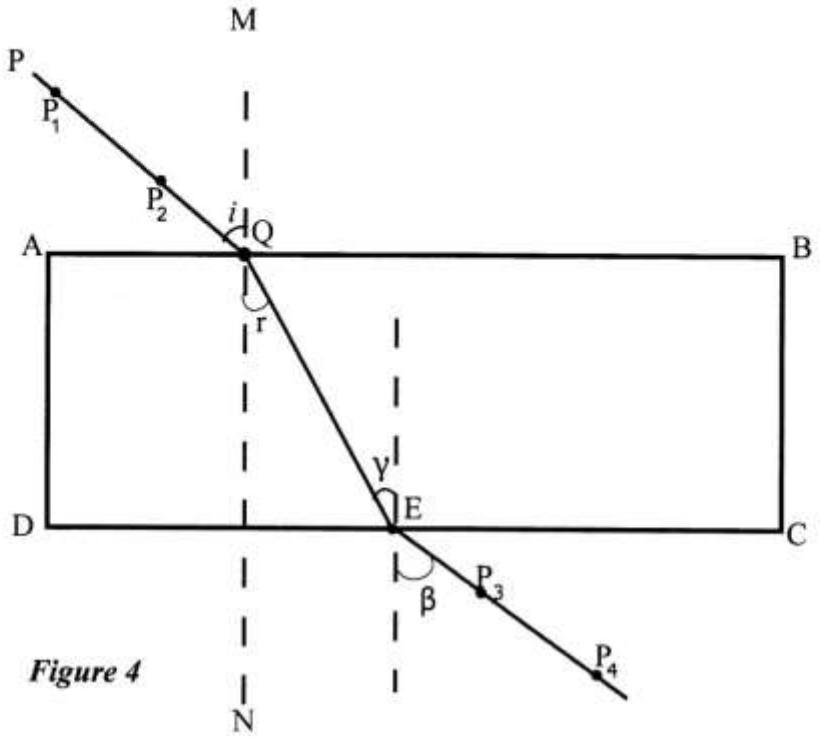

Figure 4

f) Draw a line PQ such that angle $i = 30^{\circ}$ as shown in ***figure 4***.

g) Replace the glass block on its outline.

h) Fix pins P_1 and P_2 vertically along PQ.

i) 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 images of pins P_1 and P_2

j) Remove the glass block and pins.

k) Draw a line through P_3 and P_4 to meet CD at E.

l) Join E to Q.

m) Measure and record angles: r,γ, and β.

n) Calculate the value of n_2 from the expression: $n_2 = \frac{\sin\frac{(i+\beta)}{2}}{\sin\frac{(r+\gamma)}{2}}$

o) Calculate the value of the refractive index, n of the material of the glass block from the expression: $n = \frac{(n_1+n_2)}{2}$

HAND IN THE TRACING PAPERS USED IN THE EXPERIMENT TOGETHER WITH YOUR WORK

3. In this experiment, you will determine the resistance R_b of the filament of the torch bulb and the resistivity ρ of the bare wire labeled W. (33 marks)

METHOD I

a) Connect the circuit shown in ***figure 5*** with the standard resistor Rs = 5Ω in the right hand gap of the metre bridge, wire W and the torch bulb in the left hand gap of the metre bridge.

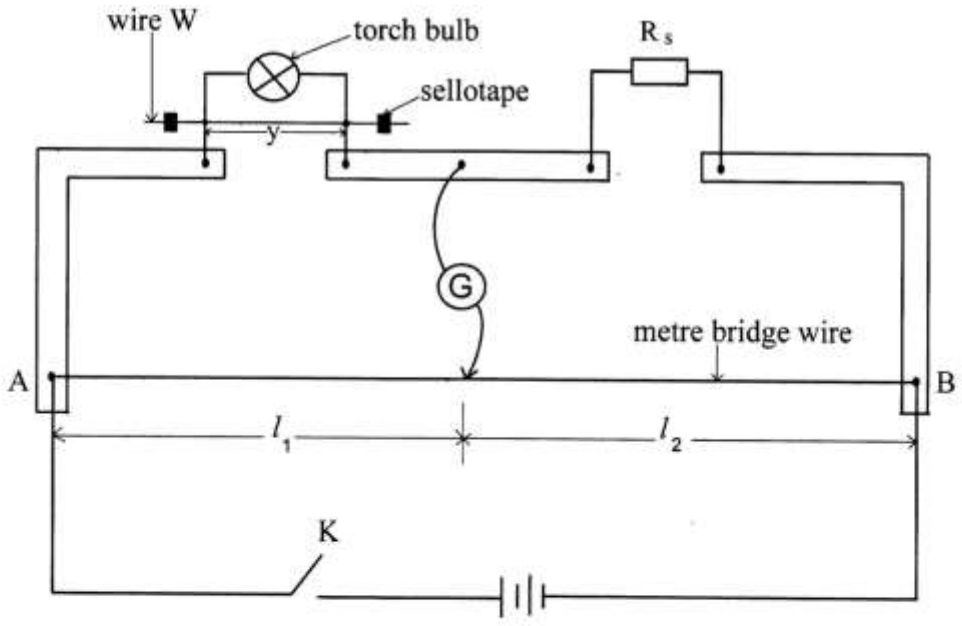

Figure 5

b) Adjust the length y of the bare wire W to 0.200m.

c) Close switch K.

d) Move the jockey along the metre bridge wire AB to locate a point for which the galvanometer G shows no deflection.

e) Read and record the balance lengths l_1 and l_2

f) Open switch K.

g) Repeat procedures (b) to (f) for values of y = 0.300, 0.400, 0.500, 0.600 and 0.700m.

h) Record your results in a suitable table including values of $\frac{l_2}{l_1}$ and $\frac{1}{y}$

i) Plot a graph of $\frac{l_2}{l_1}$ against $\frac{1}{y}$

j) Determine the slope S_0 of the graph.

k) Read and record the intercept C_0 on the $\frac{l_2}{l_1}$ – axis

l) Calculate the value of $\boldsymbol{R_1}$ from the expression: $\boldsymbol{R_1} = \frac{R_S}{C_0}$

m) Measure and record the diameter **d** of the bare wire W.

n) Calculate the value of the resistivity, $\boldsymbol{\rho}$ of the bare wire W from the expression:

$$\boldsymbol{\rho} = \frac{\Pi d^2 R_S}{4S_0} \qquad \text{where } \Pi = 3.14$$

METHOD II

(a) Connect the circuit shown in ***figure 6***.

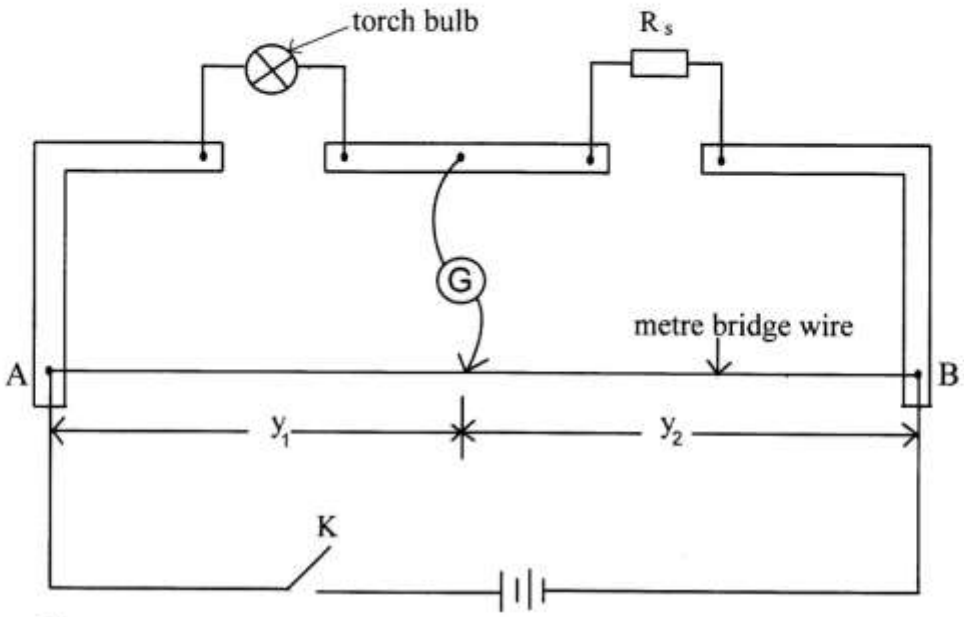

Figure 6

b) Close switch K.

c) Move the jockey along the metre bridge wire AB to locate a point for which the galvanometer G shows no deflection.

d) Read and record the balance length y_1 and y_2

e) Open switch K.

f) Calculate the value of R_2 from the expression: $R_2 = \frac{R_s y_1}{y_2}$

g) Calculate the resistance R_b of the filament of the torch bulb from the expression:

$$R_b = \frac{(R_1+R_2)}{2}$$

END