

## OPENER EXAM YEAR 2021 TERM 2

### PHYSICS FORM THREE PRACTICAL PAPER 3

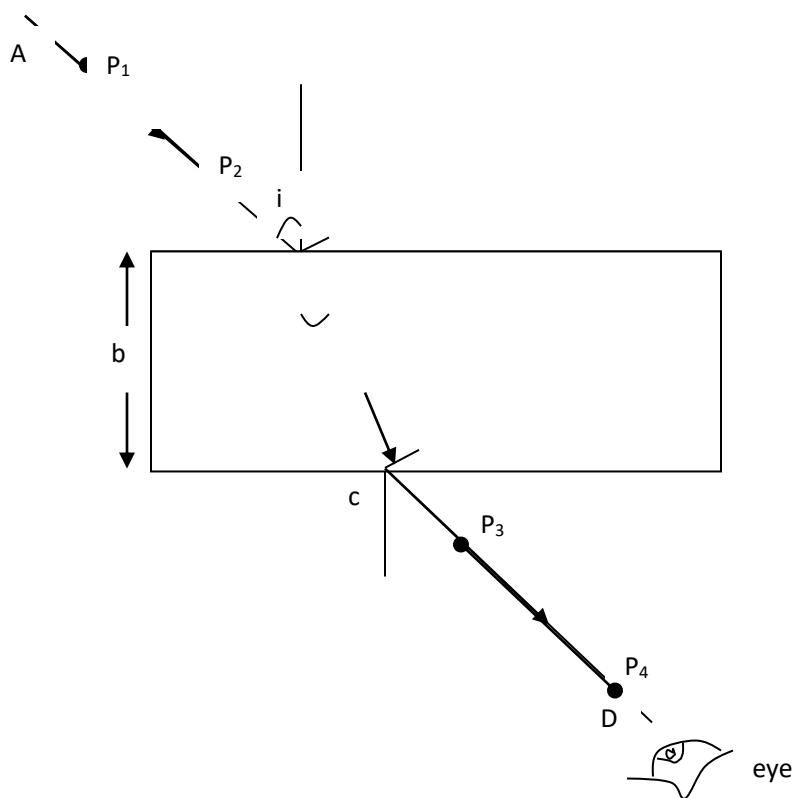
TIME: 2HRS; 15MINS

1. You are provided with the following;

- a rectangular glass block
- 4 optical pins
- a soft board
- a plain paper

Proceed as follows:

- (a) Place the glass block on the plain paper with one of the largest face upper most. Trace round the glass block using a pencil as shown below.



- (b) Remove the glass block and construct a normal at B. Construct an incident ray AB of angle of incidence,  $i = 20^\circ$ .
- (c) Replace the glass block and trace the ray ABCD using the optical pins.

- (d) Remove the glass block and draw the path of the ray ABCD using a pencil. Measure length L and record it in the table below.

Angle $i^\circ$	L (cm)	$L^2$ (cm <sup>2</sup> )	$\frac{1}{L^2}$ (cm <sup>-2</sup> )	$\text{Sin}^2 i$
20				0.1170
30				0.2500
40				0.4132
50				0.5868
60				0.7500
70				0.8830

(6 marks)

- (e) Repeat the procedure above for the angles of incidence given.

- (f) Calculate the value of  $L^2$  and  $\frac{1}{L^2}$ ; Record in the table.

- (g) Plot a graph of  $\frac{1}{L^2}$  (y-axis) against  $\text{Sin}^2 i$ .

(5 marks)

- (h) Calculate the gradient, S.

(3 marks)

Given that the equation of that graph is:  $\frac{1}{L^2} = -\left(\frac{1}{n^2 b^2}\right) \text{Sin}^2 i + \frac{1}{b^2}$

- (i) Determine the  $\frac{1}{L^2}$  – intercept C and the  $\text{Sin}^2 i$  – intercept B.

C = \_\_\_\_\_

(1 mark)

B = \_\_\_\_\_

(1 mark)

- (j) Calculate the value of Q given by;

(2 marks)

$$Q = -\left(\frac{C}{S}\right) \div B$$

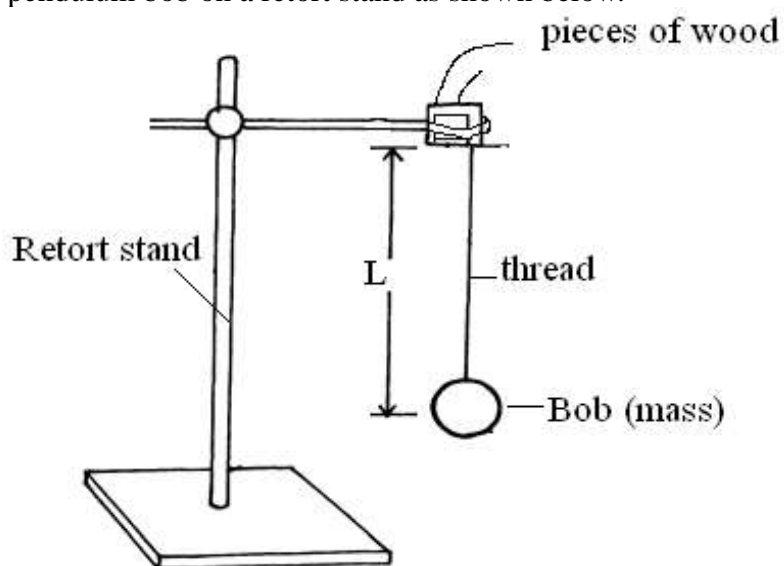
- (k) Hand in your constructions on the plain paper together with the answer script. (2 marks)

2. You are provided with the following;

- A pendulum bob
- Two pieces of wood
- A retort stand
- A boss
- A clamp
- A stop watch
- A metre rule/or half metre rule
- A piece of thread

**Proceed as follows;**

a) Suspend a pendulum bob on a retort stand as shown below.



b) Displace the bob for a small angle. As it is oscillating time ten oscillations for every length of the string shown in the table below (9marks)

<b>Length, <math>l(m)</math></b>	0.4	0.6	0.8	1.0	1.2	1.4
<b>Time ,<math>t</math>, for 10 oscillations(s)</b>						

Periodic time, T(s)						
$F = \frac{1}{T}$ (Hz)						
$F^2$ (Hz <sup>2</sup> )						
$\frac{1}{L}$ (m <sup>-1</sup> )						

C) Plot a graph of  $F^2$  against  $1/L$ . (5 marks)

d) Determine the slope,  $S$ , of the graph. (3 marks)

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e) Given that the relationship between  $F$  and  $L$  is given by,  $F^2 = \frac{g}{4\pi^2 L}$ , use the graph to determine the value of  $g$  giving its units . (3marks)

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