

**PHYSICS DEPARTMENT**

**END OF YEAR EXAMINATIONS**

**November 2014**

**S5 Paper 3**

**Practical Physics**

**3¼ hours**

**Answer both questions**

*You are* **not allowed** *to use the apparatus or write for* ***the first fifteen minutes*.**

*Graph papers are provided.*

*You are expected to record on your answer sheet all your 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.*

**QUESTION 1**

In this experiment, you will determine Young’s modulus, E, for a metre rule using two methods.

**METHOD I**

G-clamp

*x*

Metre rule

100g

**Fig 1**

Table

Small wooden pieces

1. Measure and record the breadth, b, and the thickness, d, of the metre rule provided.
2. Clamp the metre rule on the table with length *x* = 0.900 m free as shown in Figure 1.
3. Suspend a mass of 0.100 kg at a distance 2.0 cm from the free end of the metre rule.
4. Set the metre rule into vertical vibration.
5. Measure the time, t, for 20 oscillations.
6. Calculate the period, T
7. Calculate E given that  **E** **=** 

**METHOD II**

M = 500g

45.0cm

45.0cm

Knife edge

C

Half-metre rule

**Fig. 2**

Pointer

1. Locate the centre of gravity, C, of the metre rule.
2. Attach a pointer to the metre rule at C using piece of cello tape.
3. Support the metre rule with its scale facing up on two knife edges, such that the distance of each knife edge from C is 0.450 m as shown in Figure 2.
4. Read and record the position, Po, of the pointer.
5. Suspend a mass M = 0.100 kg at C and record the new position, P1, of the pointer.
6. Determine the depression, y, in metres.
7. Repeat procedures (e) and (f) for values of M = 0.200, 0.300, 0.400, 0.500 and 0.600 kg.
8. Remove the masses from the metre rule.
9. Plot a graph of y against M.
10. Find the slope, s, of the graph.
11. Calculate E given that **E =** , where *l* is the distance between the two knife edges and g = 9.81 m s-2.

**QUESTION 2**

In this experiment, you will determine the refractive index, n, of the material of the prism provided.

1. Fix a white sheet of paper on the soft board.
2. Place the prism on the sheet of paper and trace its triangular outline, UVW.
3. Mark a point, B, on UW such that B is about midway between U and W.

A

U

V

W

B

E

D

C

P1

P2

P3

P4

α

φ

θ

**Fig. 3**

T

1. Draw a line ABT making an angle, α = 60o with UW at B as shown in Figure 3.
2. Place the prism back on its outline.
3. Fix optical pins P1 and P2 along AB
4. Looking from side VW, fix pins P3 and P4, such that they appear in line with the images of pins P1 and P2.
5. Remove the prism and draw a line CE through points P3 and P4 to meet line VW at D.
6. Measure and record angles VDC = θ and CET = φ.
7. Find γ = φ + θ - 90.
8. Repeat procedures (d) to (j) for α = 55o, 50o, 45o, 40o, 35o, 30o and 25o.
9. Tabulate your results including values of β = 90 - α.
10. Plot graphs of γ against β and φ against β **using the same axes**.
11. Read and record the intercept, C, on the β - axis on the graph of γ against β.
12. Read and record the minimum value, φo, of φ from the graph of φ against β.
13. Calculate n given that **n sin = sin**