THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

031/2A

PHYSICS 2A
ACTUAL PRACTICAL A
(For Both School and Private Candidates)

Time: 2:30 Hours **Wednesday, 08th November 2017 a.m.**

Instructions

1. This paper consists of **two** (**2**) questions. Answer **all** the questions.
2. Calculations should be shown clearly.
3. Marks for questions are indicated at the end of each question.
4. Calculators, cellular phones and any unauthorised materials are **not** allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s).
6. The following information may be useful:
   $\pi = 3.14$
   Acceleration due to gravity, $g = 10 m/s^2$.

1. The aim of the experiment in Figure 1 is to determine the Young's Modulus, Y, of a wooden meter rule.

(a) Clamp a meter rule along the top of the bench with its graduated face upwards and with a length L of about 85cm projecting beyond the edge of the bench. Record the length of L.

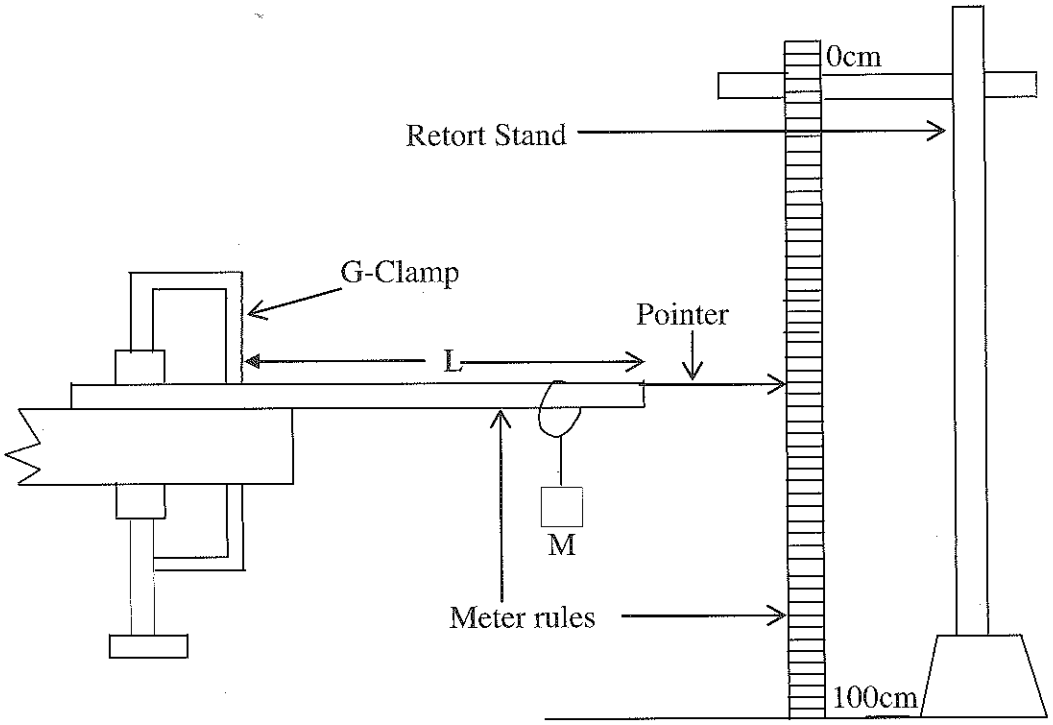

Figure 1

(b) Attach the pointer to the free end of the meter rule and note its position X_0 on a meter rule clamped vertically in retort stand when unloaded.

(c) Suspend a load M of 50g at a distance 1.0cm from the free end. Note the new position X of the pointer and then deduce the depression, d, of the pointer on the meter rule scale.

(d) Repeat procedure (c) above for M equal to 100g, 150g, 200g and 250g.

(e) Tabulate your results.

(f) Plot the graph of d against M.

(g) Find the slope, S, of the graph.

(h) Use the vernier caliper to measure the breadth, b, and the thickness, t, of the meter rule.

(i) Calculate Young's modulus for the wooden meter rule from the expression $\frac{Sb}{4g} = \frac{1}{Y} \times \left(\frac{L}{t}\right)^3$.

(j) Mention two sources of errors and two precautions taken in this experiment.

(25 marks)

2. The aim of this experiment is to determine the refractive index n of a glass block.

(a) Fix the plane sheet of paper provided on the soft board using optical pins.

(b) Place the glass block on the sheet of paper so that the largest face is topmost as shown in Figure 2 and trace out the outline of the glass block.

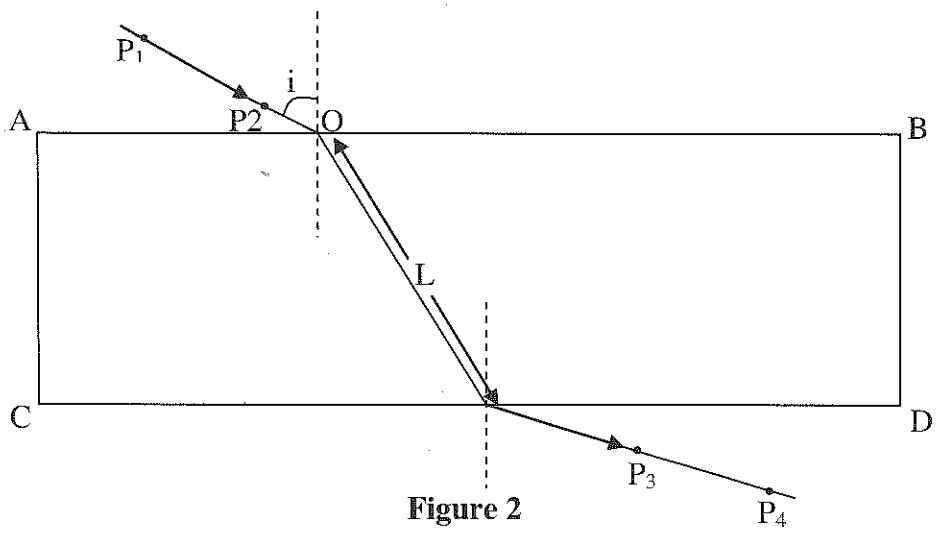

Figure 2

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(c) Stick pins P_1 and P_2 in the soft board in such a way that the angle of incidence i is 25^0 and make sure that AO is less than one third of AB.

(d) Place pins P_3 and P_4 so that they may appear to be in line with the images of P_1 and P2 as observed through the face CD of the block.

(e) Remove the block and trace the ray through it.

(f) Measure and record the distance L.

(g) Replace the block and repeat procedures (c) to (f) for the angle of incidence i = 35^0, 45^0, 55^0 and 65^0.

(h) Tabulate your results including the values of $\sin^2 i$ and $1/L^2$.

(i) Plot a graph of $\sin^2 i$ against $1/L^2$.

(j) Determine the slope, s, of your graph and the intercept C_1 on the $\sin^2 i$ axis.

(k) Find the values of 'n' from the relation $n = \sqrt{C_1}$ and the breadth b of the glass block from the relation $b = \frac{\sqrt{(-s)}}{n}$.

(25 marks)

Note: The diagrams for question 2 should be attached to answer booklet(s)