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

031/2C

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

Time: 2:30 Hours **Thursday, 21st November 2013 a.m.**

Instructions

1. This paper consists of **two (2)** questions. Answer **all** the questions.
2. Each question carries 25 marks.
3. Where calculations are involved show your work clearly.
4. Calculators and cellular phones are **not** allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s).
6. Use $\pi = 3.14$.

1. You are provided with a meter rule, a knife edge, a 100g mass and a thread. Proceed as follows:

Using a metre rule and knife-edge balance the rule (with its graduated face upwards) on the knife-edge provided and record the scale mark C, corresponding to the distance of its centre of gravity from the zero mark.

Balance the metre rule on knife-edge as illustrated in Figure 1 while the 100g mass is suspended at a distance y = 2.5 cm from the 0 (zero) end of the metre rule. Measure the corresponding distance x from the knife-edge to the 100g mass.

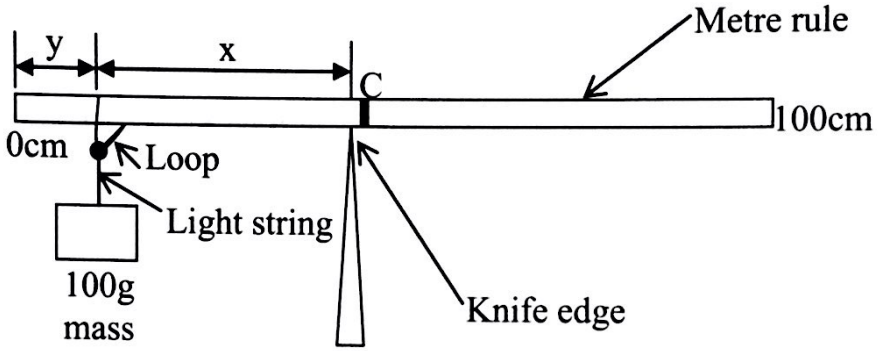


Figure 1

Repeat the procedure above with the 100g mass for y = 5cm, 10cm, 20cm, 30cm and 40 cm.

(a) What is the length of C (in cm) from zero mark?
(b) Tabulate your results for y and x.
(c) Plot a graph of y against x.
(d) State the nature of the graph.
(e) Determine the y-intercept.
(f) Comment on the value obtained in 1 (e).
(g) Determine the slope of the graph.
(h) Calculate from your graph the mass, m, of the metre rule given that;

$$y = C - x\left(\frac{m+100}{m}\right).$$

(i) Identify and state the principle governing this experiment.
(j) From your graph, find:
  (i) The value of y for which x = 8.
  (ii) The value of x for which y = 14.
(k) State a possible source of error in this experiment.
(l) What is the aim of this experiment?

(25 marks

The aim of this experiment is to determine the critical angle of the given glass block.

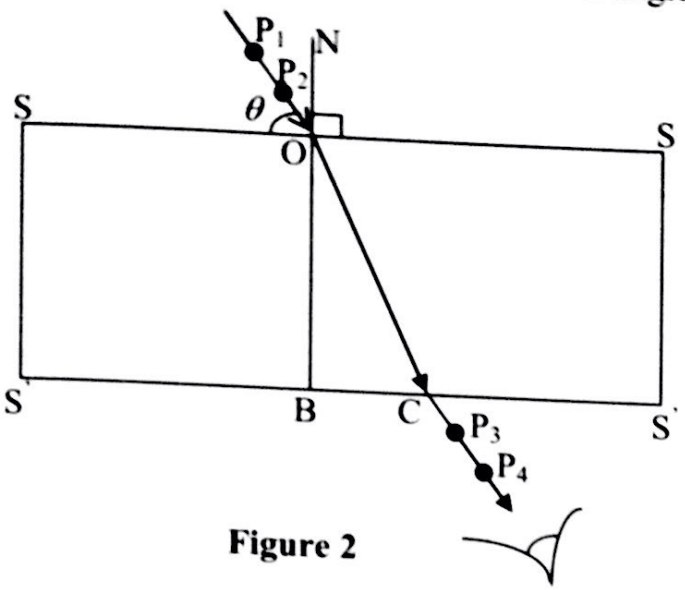


Figure 2

Proceed as follows:
Place the rectangular glass block on the drawing board. Use a sharp pencil to trace the outline of the block. Remove the block and draw the normal NOB near the left end of the block (see Figure 2 above).

Draw a line making angle θ of 20° with the surface SS of the block. Erect two pins P_1 and P_2 on this line at about 5cm apart. Place the block back in its place and erect more pins P_3 and P_4 at positions which appear to be in a straight line with the other two pins as seen through the block. Again remove the block and draw the complete path of the ray (see Figure 2). Measure the distances BC and OC.

Repeat this procedure for values of angle θ equal to 30°, 40°, 50° and 60° and in each case make your drawing on a fresh part of the drawing paper.

(a) Record clearly the values of θ, BC, OC, $\frac{BC}{OC}$ and cos θ in a tabular form.

(b) Plot a graph of $\frac{BC}{OC}$ against cos θ.

(c) State the nature of the graph.

(d) Find the slope S of the graph.

(e) Calculate the reciprocal of the slope.

(f) Comment on the value obtained in 2 (e).

(g) From the graph, determine the value of cos θ when $\frac{BC}{OC} = 0.15$.

(h) Calculate the value of critical angle C, given that S = SinC.

(i) State any two sources of errors.

(j) State two precautions to be taken in this experiment.

(25 marks)