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

**031/2A** **PHYSICS 2A**
**ALTERNATIVE A PRACTICAL**
(For Both School and Private Candidates)

***TIME: 2½ Hours*** ***Friday 10th October 2008 a.m.***

---

**Instructions**

1. The paper consists of **three (3)** questions.
2. Answer **two (2)** questions including question **number 1**.
3. Where calculations are involved show your work clearly.
4. Marks for questions are indicated at the end of each question.
5. Electronic calculators are **not** allowed in the examination room.
6. Cellular phones are **not** allowed in the examination room.
7. Write your **Examination number** on every page of your answer booklet(s).

This paper consists of 5 printed pages

1. The aim of this experiment is to investigate whether string A obeys Hooke's law.

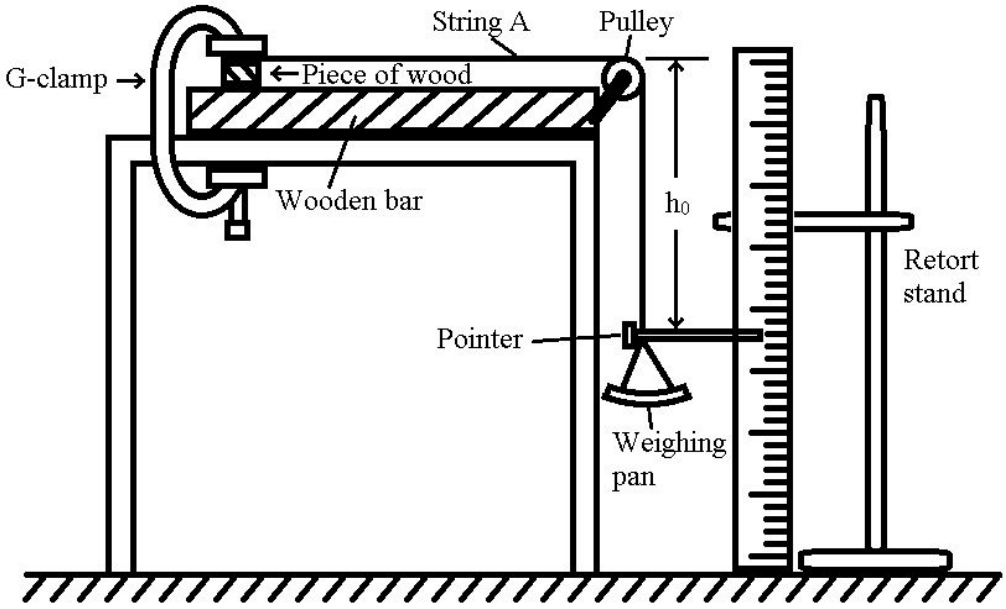



Figure 1

Proceed as follows:

Clam string A at one end, attach a weighing pan at the other end and a pointer to give a reading on a scale as shown in Figure 1 above.

Measure the height, $h_0$ when the pan is empty.

Place 50 g mass on the pan and record the new height h indicated by the pointer.

Add another 50 g mass each time up to 300 g, and record the corresponding values of h for added mass.

(a) Tabulate your results as shown in the table below.
$h_0$ = ____ cm.

| Mass m, (g) | Height, h (cm) | Extension (h-$h_0$) cm | Stretching force, F (N) |
|---|---|---|---|
| 50<br>100<br>150<br>200<br>300 | | | |

(b) Plot a graph of force F (N) against extension (cm).

(c) From the graph find the
(i) slope, K of the graph
(ii) extension caused by a mass of 180 g.

(d) Deduce whether string A obeys Hooke's law.

(e) State the law.

**(25 marks)**

2. You are provided with a glass block, four sheets of drawing paper, four optical pins (or office pins) and a drawing board.

Proceed as follows:

Place the glass block flat on the drawing paper fixed to the drawing board and with a sharp pencil, draw its outline.

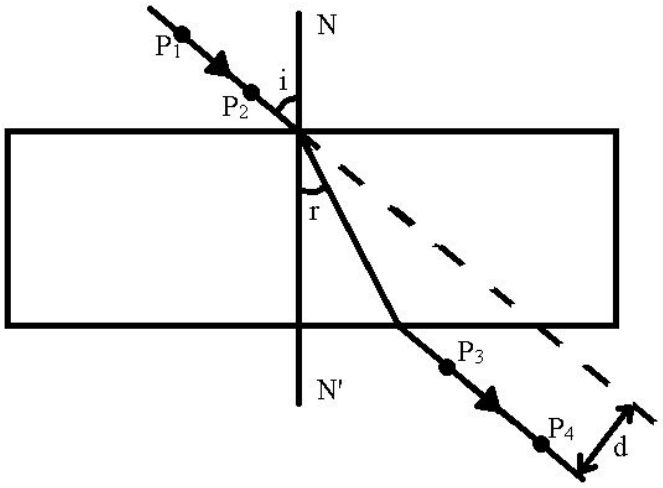



Figure 2

Remove the glass block and draw a normal NN' to the longer edge of the block (see Fig. 2) Draw a line making an angle of incidence (i) of 30°. Stick two vertical pins $P_1$ and $P_2$ on this line. Replace the glass block. Stick two more pins $P_3$ and $P_4$ on the other side of the block so that they appear to be in the same straight line with the images of pins $P_1$ and $P_2$ as seen through the block. Remove the block and draw the complete path of the ray entering and leaving the block. Measure the angle of refraction (r).

Produce the incident ray as shown in Fig. 2 and measure the perpendicular distance (d) between the incident ray and the emergent ray.

Repeat this procedure for angles of incidence of 40°, 50°, 60° and 70°. In each case draw the block again on a fresh part of the paper.

(a) Record your results in a table as follows:

| i° | r° | d (cm) | d cos r (cm) | sin(i-r) |
|---|---|---|---|---|
| 30<br>40<br>50<br>60<br>70 | | | | |

(b) Plot a graph of d cos r (vertical axis) against sin (i-r) (horizontal axis)

(c) Find the gradient of the graph.

(d) Measure the width of the glass block.

(e) How is the gradient related to the width of the glass block?

NB: Hand in your diagrams together with your answer booklet.

**(25 marks)**

3. The aim of this experiment is to determine the resistance of a wire W.
Proceed as follows:

(a) Connect in series the full length of wire W of unknown resistance, battery B (3 V), a switch K, a rheostat Rh of a few ohms and an ammeter A of 0-1 A.
Connect the voltmeter V of 0-3 V across W. Check that the +ve side of the ammeter A and the +ve side of the voltmeter V are both on the +ve side of the battery B.

(b) Switch on the current. Adjust the rheostat to obtain five widely different values of V and corresponding values of current I.

(c) Tabulate your results as follows:

| Potential difference V (volts) | Current I (amperes) |
|---|---|
| | |

(d) (i) Draw a circuit diagram.
(ii) Plot a graph of potential difference V against current I
(iii) Find the slope of the graph.
(iv) Determine the resistance of the wire W.

(v) Mention **two (2)** main precautions to be taken in this experiment.

**(25 marks)**