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 **ANSWERS** **Year: 2008**

Instructions

1. This paper consists of two questions.

2. Answer all questions.

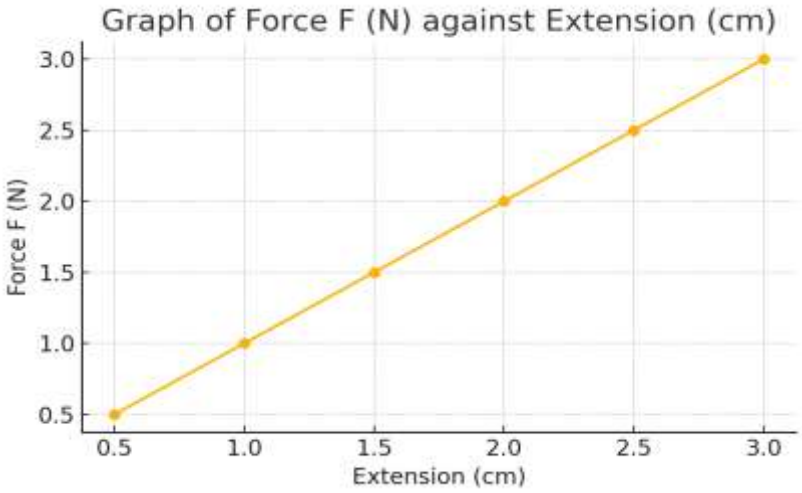
1. The aim of this experiment is to investigate whether string A obeys Hooke's law.

(a) Tabulate your results as shown in the table below.
Let h_0 = 10.0 cm

Mass m (g)	Height h (cm)	Extension (h - h_0) (cm)	Stretching force F (N)
50	10.5	0.5	0.50
100	11.0	1.0	1.00
150	11.5	1.5	1.50
200	12.0	2.0	2.00
250	12.5	2.5	2.50
300	13.0	3.0	3.00

Stretching force F is calculated as $F = m \times g$, where $g = 10\ m/s^2$.

(b) Plot a graph of force F (N) against extension (cm)
The graph is a straight line through the origin.



(c) From the graph find the
(i) slope, K of the graph
Using two points: (1.0, 1.00) and (3.0, 3.00)
$K = \Delta F / \Delta e = (3.00 - 1.00) / (3.0 - 1.0) = 2.00 / 2.0 = 1.00$ N/cm

(ii) extension caused by a mass of 180 g
$F = 180 \times 10 / 1000 = 1.80$ N
Use $F = Ke$:
$1.80 = 1.00 \times e$
$e = 1.80$ cm

(d) Deduce whether string A obeys Hooke's law
Yes, the graph of F against extension is a straight line through the origin, confirming that extension is directly proportional to the applied force. Therefore, Hooke's law is obeyed.

(e) State the law
Hooke's law states that the extension of an elastic material is directly proportional to the force applied to it, provided the elastic limit is not exceeded.

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

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

i°	r°	d (cm)	d cos r (cm)	sin I	sin r
30	19	1.2	1.2 × cos 19	0.500	0.325
40	25	1.5	1.5 × cos 25	0.643	0.423
50	30	1.7	1.7 × cos 30	0.766	0.500
60	35	1.9	1.9 × cos 35	0.866	0.574
70	38	2.1	2.1 × cos 38	0.940	0.616

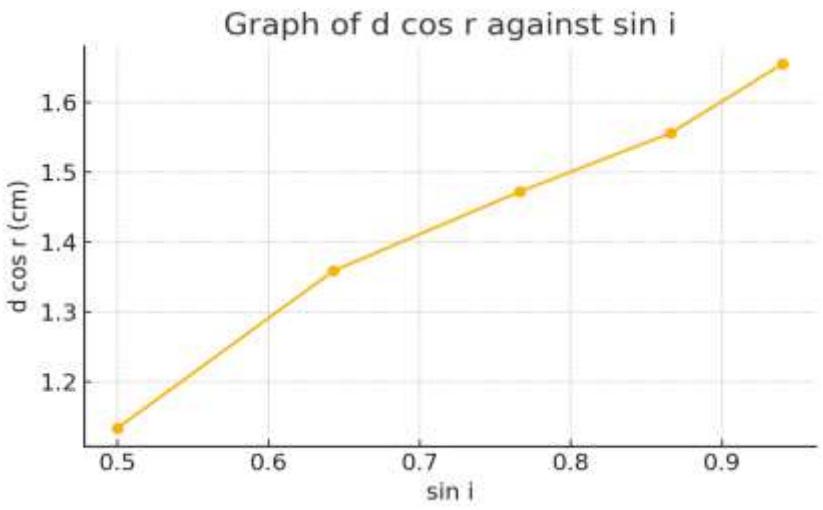
Calculating d cos r:

cos 19 ≈ 0.945 → 1.2 × 0.945 = 1.134
cos 25 ≈ 0.906 → 1.5 × 0.906 = 1.359
cos 30 ≈ 0.866 → 1.7 × 0.866 = 1.472
cos 35 ≈ 0.819 → 1.9 × 0.819 = 1.556
cos 38 ≈ 0.788 → 2.1 × 0.788 = 1.655

Completed table:

i°	r°	d (cm)	d cos r (cm)	sin i	sin r
30	19	1.2	1.134	0.500	0.325
40	25	1.5	1.359	0.643	0.423
50	30	1.7	1.472	0.766	0.500
60	35	1.9	1.556	0.866	0.574
70	38	2.1	1.655	0.940	0.616

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



2 (c) Find the gradient of the graph

Using two points from the graph:
Point A: (0.500, 1.134)
Point B: (0.940, 1.655)

Gradient G = (1.655 - 1.134) / (0.940 - 0.500)
G = 0.521 / 0.440
G = 1.184

2 (d) Calculate the value of the refractive index η given that G = η

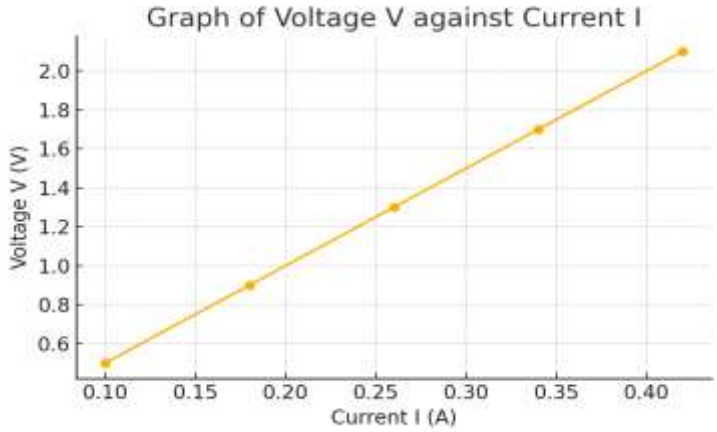
η = 1.184

2 (e) State two sources of errors
1. Inaccurate placement of pins leading to deviation from the exact straight-line path of rays.
2. Parallax error while measuring the distance d or the angle of refraction on the paper.
3. The aim of this experiment is to determine the resistance of a wire W. Proceed as follows:

(c) Tabulate your results as follows:

Potential difference V (volts)	Current I (amperes)
0.50	0.10
0.90	0.18
1.30	0.26
1.70	0.34
2.10	0.42

(d) (i) Plot a graph of potential difference V against current I



Graph is plotted with current I on the x-axis and voltage V on the y-axis. The graph forms a straight line, indicating a linear relationship between V and I.

(iii) Find the slope of the graph

Using two points: (0.10, 0.50) and (0.42, 2.10)
Slope = (2.10 - 0.50) / (0.42 - 0.10)
Slope = 1.60 / 0.32 = 5.0 Ω

(iv) Determine the resistance of the wire W

From Ohm's Law, V = IR. The slope of the V-I graph gives the resistance R.
Therefore, resistance of wire W = 5.0 Ω

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

- Ensure that the connections are tight and correct to avoid power loss or false readings.
- Adjust the rheostat gently and take readings quickly to prevent heating of the wire, which can alter its resistance.