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: 2007**

Instructions

1. This paper consists of two questions.

2. Answer all questions.

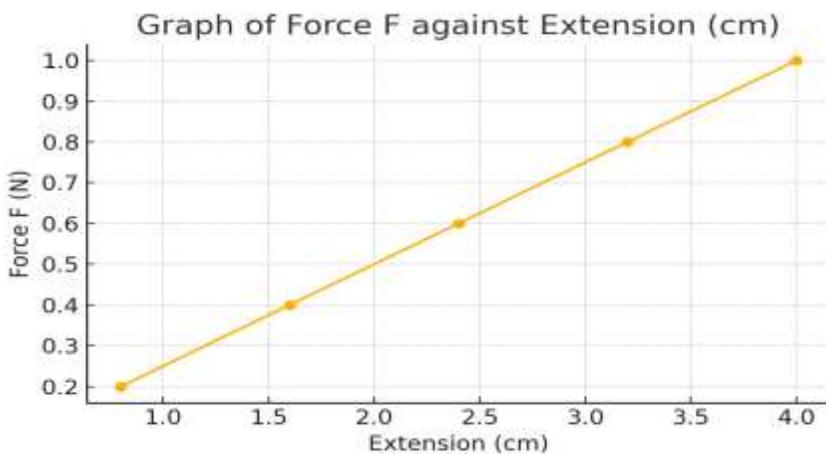1. The aim of this experiment is to determine the mass of a given object "B", and the constant of the spring provided.

(a) Record your results in tabular form as shown below:

S_0 = 10.0 cm

Mass (kg)	Force F (N)	Pointer reading S_1 (cm)	Extension S = S_1 - S_0 (cm)
0.02	0.20	10.8	0.8
0.04	0.40	11.6	1.6
0.06	0.60	12.4	2.4
0.08	0.80	13.2	3.2
0.10	1.00	14.0	4.0

(b) Plot a graph of Force F (vertical axis) against extension e (horizontal axis)
The graph is a straight line through the origin, indicating F is directly proportional to extension S.

Graph of Force F against Extension (cm)

(c) Use your graph to evaluate:

(i) Mass of B
Assume the extension for mass B is 1.2 cm
From the graph, at extension 1.2 cm → F = 0.30 N
Using F = mg, m = F / g = 0.30 / 10 = 0.030 kg = 30 g

(ii) Spring constant K
Using two points: (0.8, 0.20) and (4.0, 1.00)
K = ΔF / ΔS = (1.00 - 0.20) / (4.0 - 0.8) = 0.80 / 3.2 = 0.25 N/cm

(iii) Verify the equation F = K(S - S_0)

Using K = 0.25 N/cm, S_0 = 10.0 cm, and S_1 = 13.2 cm
S - S_0 = 13.2 - 10 = 3.2 cm
Then F = 0.25 × 3.2 = 0.80 N
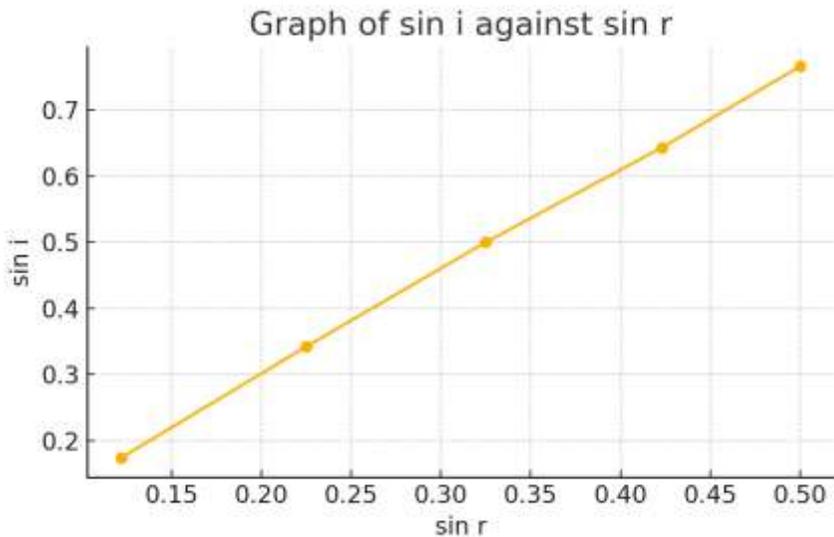Matches the value of F at 0.08 kg
F = 0.80 N

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

(a) Record the angles of incidence i and the measured corresponding angles of refraction r in a table. Your table of results should include the values of sin i and sin r.

i (°)	r (°)	sin i	sin r
10	7	0.174	0.122
20	13	0.342	0.225
30	19	0.500	0.325
40	25	0.643	0.423
50	30	0.766	0.500

(b) Plot the graph of sin i (vertical axis) against sin r (horizontal axis)
Graph is straight line with positive slope, confirming Snell's Law.

Graph of sin i against sin r

(c) Determine the slope of the graph

Use (0.500, 0.325) and (0.766, 0.500)
Slope G = (0.766 - 0.500) / (0.500 - 0.325) = 0.266 / 0.175 = 1.52

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Prepared by: Maria Marco for TETEA

(d) What is the refractive index of the glass block used?

Refractive index $\eta = G = 1.52$

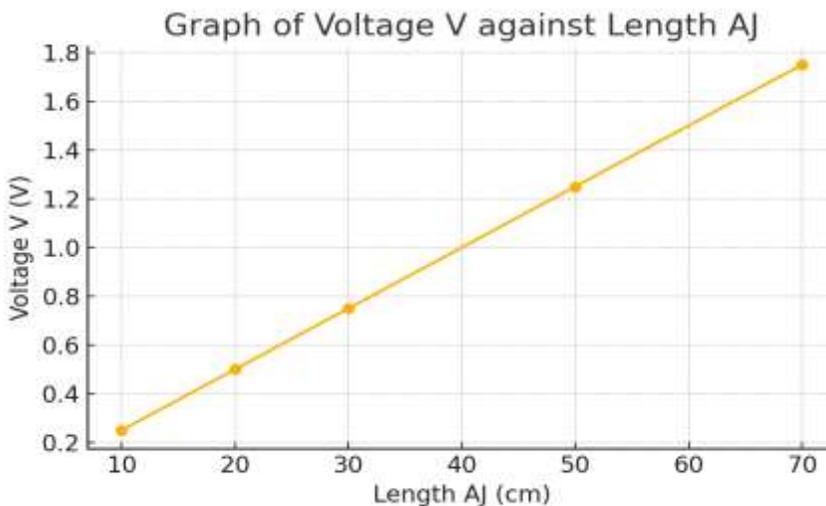(e) Mention any sources of errors in this experiment

1. Incorrect measurement of angles due to parallax or misalignment of pins
2. Scattering of light due to imperfections or dirt on the glass surface

3. The aim of this experiment is to determine the potential fall along a uniform resistance wire carrying a steady current.

(a) Tabulate your results for the values of AJ and V

AJ (cm)	V (volts)
10	0.25
20	0.50
30	0.75
50	1.25
70	1.75

(b) Plot a graph of V (vertical axis) against AJ (horizontal axis)
The graph is a straight line through the origin, showing that V is directly proportional to AJ.

Graph of Voltage V against Length AJ

(c) Calculate the slope of the graph
Using points (10, 0.25) and (70, 1.75):
Slope = (1.75 - 0.25) / (70 - 10)
Slope = 1.50 / 60 = 0.025 V/cm

(d) What is your comment on the slope?
The slope of the graph is constant, indicating that the potential difference per unit length of the wire is uniform. This confirms that the wire has a uniform resistance and the current is steady.

(e) State any precautions on the experiment
  ➢ Ensure tight and clean connections to avoid contact resistance.
  ➢ Avoid adjusting the rheostat once readings start to maintain constant current.
  ➢ Read voltmeter readings quickly to reduce heating effects in the wire.