

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

031/2B

PHYSICS 2B

ACTUAL PRACTICAL B

(For Both School and Private Candidates)

Time: 2:30 Hours

ANSWERS

Year: 2017

Instructions

1. This paper consists of two questions.
2. Answer all questions.

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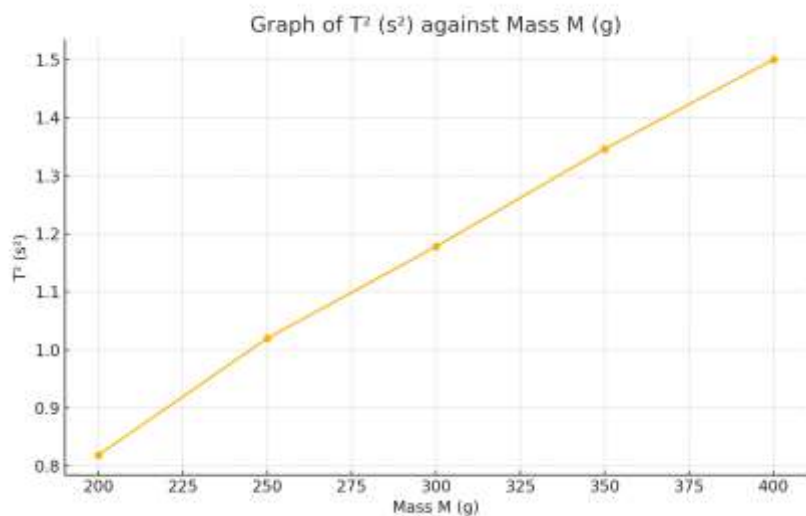


1. The aim of the experiment in Figure 1 is to determine the effective mass of the spring and its spring constant K.

- (a) Spiral spring suspended.
- (b) Initial mass $M = 200$ g pulled slightly and released.
- (c) Time for 20 oscillations is measured.
- (d) Repeat with $M = 250$ g, 300 g, 350 g, 400 g.
- (e) Tabulate results:

M (g)	t (s)	T (s)	T^2 (s^2)
200	18.1	0.905	0.819
250	20.2	1.010	1.020
300	21.7	1.085	1.178
350	23.2	1.160	1.346
400	24.5	1.225	1.500

- (f) (i) Plot a graph of T^2 against M
- (ii) Calculate slope s using:



Point A: ($M = 200$ g, $T^2 = 0.819$)

Point B: ($M = 400$ g, $T^2 = 1.500$)

$$s = (1.500 - 0.819) / (400 - 200) = 0.681 / 200 = 0.00341 \text{ s}^2/\text{g}$$

(iii) From the equation

$$T^2 = (1 / 4\pi^2 K) \times M + (1 / 4\pi^2 K) \times S$$

$$\text{Slope} = 1 / 4\pi^2 K$$

$$K = 1 / (4\pi^2 \times \text{slope}) = 1 / (39.478 \times 0.00341) \approx 7.45 \text{ N/m}$$

$$\text{Intercept} = (1 / 4\pi^2 K) \times S = 0.100$$

$$S = \text{intercept} \times 4\pi^2 K = 0.100 \times 39.478 \times 7.45 \approx 29.4 \text{ g}$$

Effective mass of spring $\approx 29.4 \text{ g}$

2. The aim of the experiment in Figure 2 is to determine the critical angle A of the given glass block.

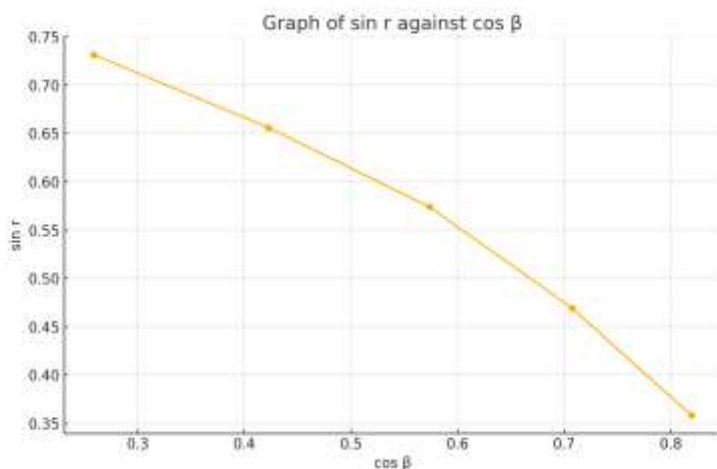
(a–g) Follow the standard ray tracing and measurement steps.

(h) Measure r and calculate $\cos \beta$ and $\sin r$ for each β .

(j) Tabulate results:

$\beta (^{\circ})$	$\cos \beta$	$r (^{\circ})$	$\sin r$
35	0.8192	21	0.3584
45	0.7071	28	0.4695
55	0.5736	35	0.5740
65	0.4226	41	0.6561
75	0.2588	47	0.7314

(k) Plot $\sin r$ against $\cos \beta$



$$(l) \text{ Gradient } G = (0.7314 - 0.3584) / (0.2588 - 0.8192)$$

$$G = 0.373 / -0.5604 \approx -0.6657$$

Take magnitude: $G = 0.6657$

$$(m) \sin A = G \rightarrow A = \sin^{-1}(0.6657) \approx 41.7^{\circ}$$

Critical angle $A \approx 41.7^{\circ}$