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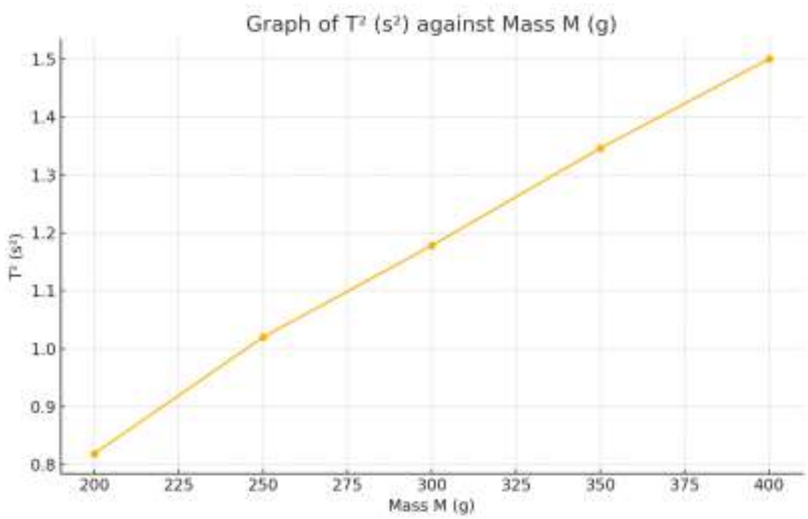
1. The aim of the experiment in Figure 1 is to determine the effective mass of the spring and its spring constant K.

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

(iii) From the equation
$T^2 = (1 / 4\pi^2K) \times M + (1 / 4\pi^2K) \times S$
Slope = $1 / 4\pi^2K$

$K = 1 / (4\pi^2 \times \text{slope}) = 1 / (39.478 \times 0.00341) \approx 7.45$ N/m
Intercept $= (1 / 4\pi^2 K) \times S = 0.100$
$S = \text{intercept} \times 4\pi^2 K = 0.100 \times 39.478 \times 7.45 \approx 29.4$ g
Effective mass of spring ≈ 29.4 g

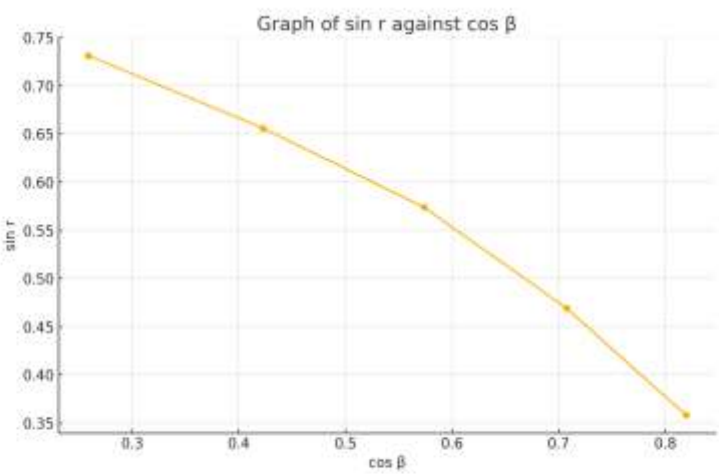
2. The aim of the experiment in Figure 2 is to determine the critical angle A of the given glass block.

(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:

β (°)	cosβ	r (°)	sinr
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 sinr against cosβ



(l) Gradient $G = (0.7314 - 0.3584) / (0.2588 - 0.8192)$
$G = 0.373 / -0.5604 \approx -0.6657$
Take magnitude: $G = 0.6657$

(m) $\sin A = G \rightarrow A = \sin^{-1}(0.6657) \approx 41.7°$
Critical angle A ≈ 41.7°