

**CHRISTIAN SOCIAL SERVICES COMMISSION (CSSC)
NORTHERN ZONE JOINT EXAMINATIONS SYNDICATE (NZ-JES)**



FORM FOUR PRE-NATIONALEXAMINATION2026

031/2A

PHYSICS 2A

MARKING SCHEME

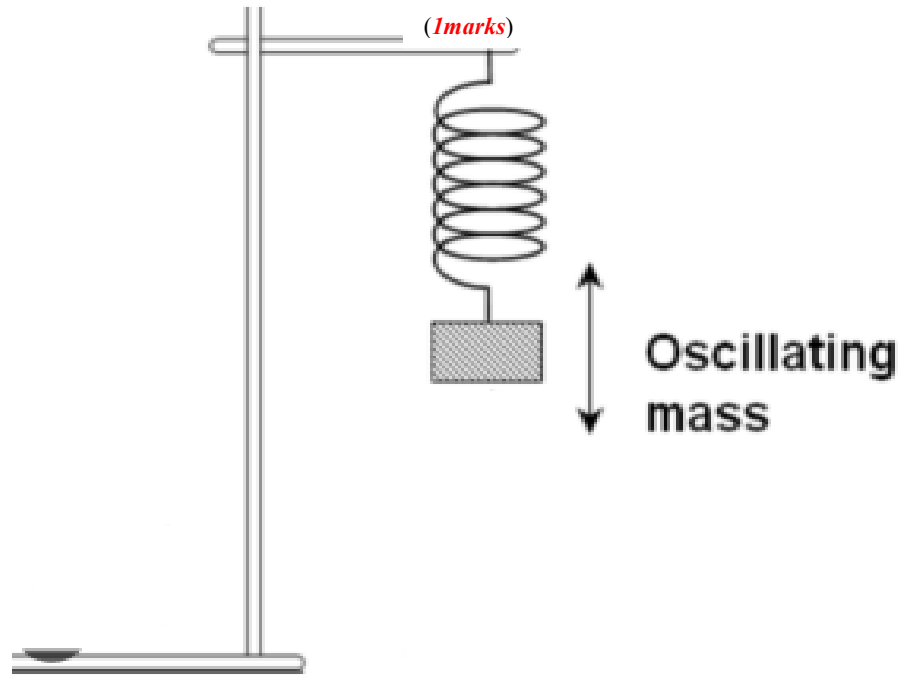
❖ QUESTION 1:

(e) Table of results:

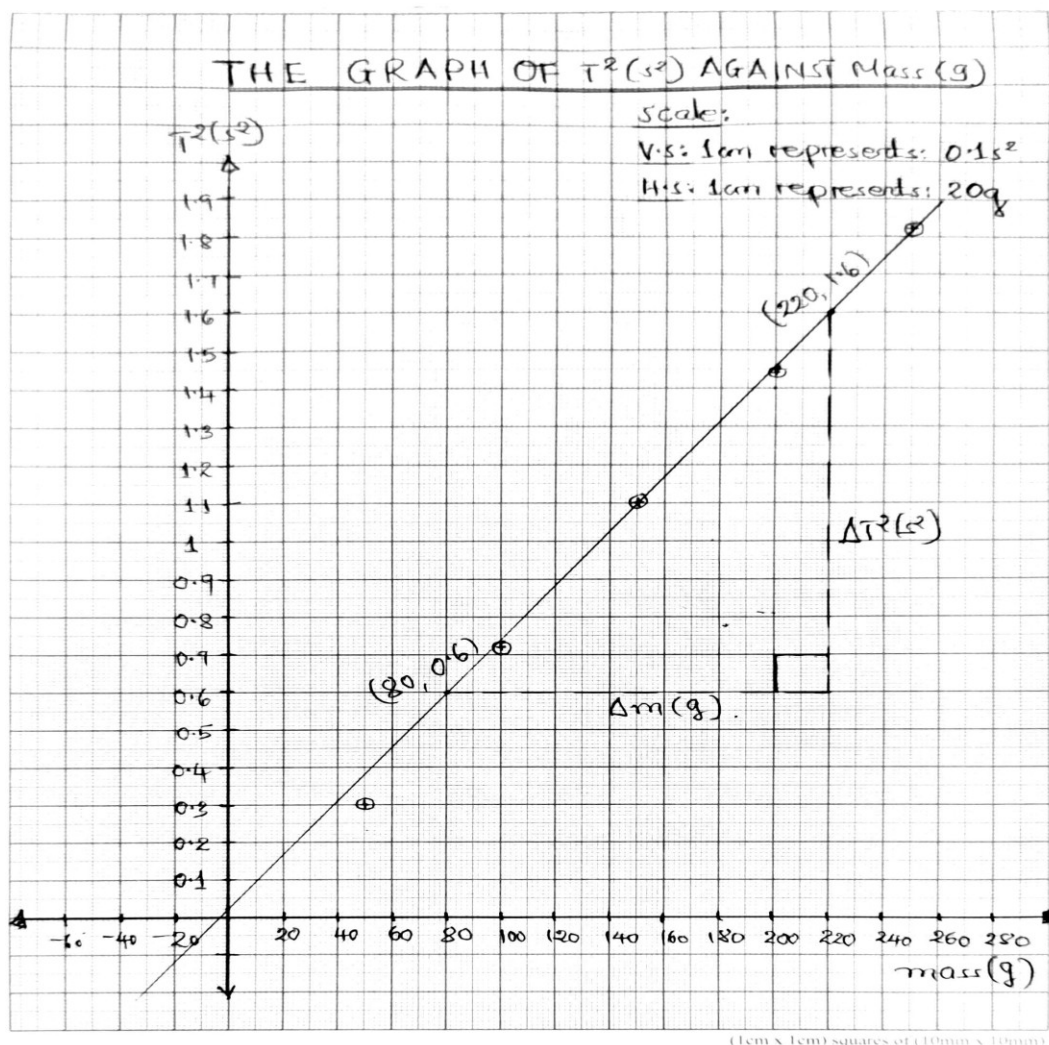
Mass (M) (g)	t(s)	T(s)	T ² (s ²)
50	11	0.55	0.3025
100	17	0.85	0.7225
150	21	1.05	1.1025
200	24	1.20	1.4400
250	27	1.35	1.8225

(2marks) (2marks) (2marks)

(f) Diagram of the experiment.



(i) The graph of $T^2(s^2)$ against $M(g)$



T = 01 Mark Sc
 = @ 0.5Mark Ax
 = @ 0.5Mark SI
 = 01 Mark BL =
 01 Mark TP = 3
 Marks **Total = 8**
Marks

$$(ii) \quad \text{Slope (m)} = \frac{\Delta T^2 (s)^2}{\Delta m (g)} \text{ (0.5marks)}$$

$$(m) = \frac{1.6 - 0.6 (s^2)}{220 - 80 (g)} \text{ (0.5marks)}$$

$$(m) = 0.00714 s^2 / g$$

$\therefore$ The slope of the graph is $0.00714 s^2 / g$ (2marks)

(iii) From the given equation:

$$T = 2\pi \sqrt{\frac{M+s}{K}}$$

$$T^2 = \left(\frac{4\pi^2}{K}\right) M + \frac{4\pi^2 S}{K} \quad (1\text{marks})$$

$$Y = m x + c$$

$$\text{Slope (m)} = \frac{4\pi^2}{K}$$

$$0.00714 s^2 / g = \frac{4\pi^2}{K}$$

$$K = \frac{4\pi^2}{0.00714 s^2 / g}$$

$$\therefore K = 5529.19 g / s^2 \text{ (1marks)}$$

Also:

From the equation:

$$c = \frac{4\pi^2 S}{K} \text{ (1marks)}$$

$$S = \frac{ck}{4\pi^2}$$

$$S = \frac{0.02 s^2 \times 5529.19 g / s^2}{4\pi^2}$$

$$\therefore S = 2.8 g \text{ (1marks)}$$

(iv) The aim of the experiment was to determine the spring constant and the effective mass of the spring. (1marks)

(v) Sources of error are:

- **Error caused by air resistance which can affect the oscillation of the spring (0.5marks)**

➤ It can be minimized by closing the windows and switch off the fans when performing the experiment (0.5marks)

- **Error due to poor reaction time. (0.5marks)**

➤ It can be minimized by being more accurate when starting and stopping of the stopwatch. (0.5marks)

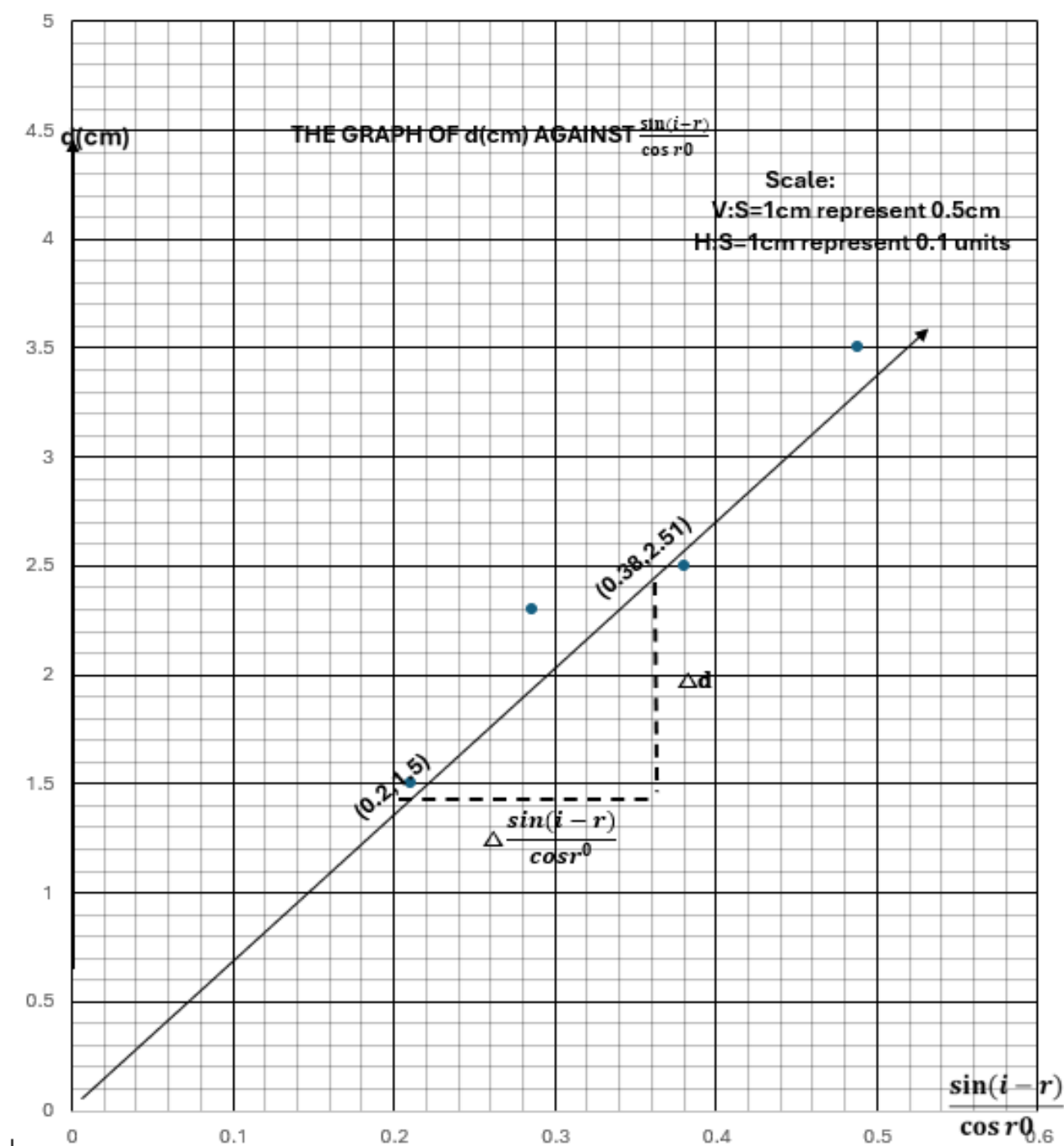
QUESTION NUMBER 2

- i. The table of results

i^0	r^0	$i^0 - r^0$	$\cos r^0$	$\sin(i^0 - r^0)$	$d(\text{cm})$	$\frac{\sin(i - r)}{\cos r^0}$
60	37	23	0.799	0.390	3.5	0.488
50	31	19	0.857	0.326	2.5	0.380
40	25	15	0.906	0.259	2.3	0.286
30	19	11	0.946	0.190	1.5	0.200

12 marks, @ $\frac{1}{2}$

- ii. The graph of d against $\frac{\sin(i-r)}{\cos r^0}$



Total 7 1/2 marks.

Title: 1 mark

Scale: 1 mark

Axis labelling: 1 mark @ 1/2

Slope indication: 1 mark

Best line: 1 mark

iii. Slope of the graph

From the graph,

$$\text{slope} = \frac{\Delta d(\text{cm})}{\Delta \frac{\sin(i-r)}{\cos r}} \dots\dots\dots 1 \text{ mark}$$

$$\text{slope} = \frac{2.51-1.5}{0.38-0.2} = \frac{0.01}{0.18} \dots\dots\dots 1 \text{ mark}$$

$$\text{slope} = 6.3 \text{ cm} \dots\dots\dots 1 \text{ mark}$$

Therefore, the slope of the graph is 6.3 cm..... 1/2 mark

iv. The width of the glass block is 6.4 cm **1 mark**

v. The value of slope of the graph is approximately equal to the width, W of the glass block. **1 mark**