

CSSC SOUTHERN ZONE
PHYSICS 2A MARKING SCHEME 2026

1 (a) Table of result.

$x(\text{cm})$	$t(\text{sec})$	$T(\frac{t}{t_0})\text{sec}$	$T^2(\text{sec}^2)$
10	8.94	0.894	0.7992
30	12.65	1.265	1.6002
50	15.49	1.549	2.3994
70	17.89	1.989	3.2005
90	20.00	2.000	4.0000

(2 marks @)

(Total 10 marks)

(c) (i) The graph of $T^2(\text{sec}^2)$ against $x(\text{cm})$

(ii)
$$\text{Slope} = \frac{\Delta T^2(\text{sec}^2)}{\Delta x(\text{cm})} \quad (\text{0.5 mark})$$

$$= \frac{(3.575 - 1)}{(80 - 16)}$$

$$= 0.0402$$

$$\approx 0.04 \text{ sec}^2/\text{cm}$$

(1 mark)

The slope is $0.04 \text{ sec}^2/\text{cm}$.

(iii) From $T^2 = \left(\frac{4\pi^2}{g}\right)x + \frac{4\pi^2}{g}b$

$$y = mx + c$$

$$\text{Slope} = \frac{4\pi^2}{g}$$

$$g = \frac{4\pi^2}{\text{slope}}$$

(0.5 mark)

1 (e) (ii)

$$g = \frac{4\pi^2}{0.04 \text{ sec}^2/\text{cm}}$$

$$= 100\pi \text{ cm/s}^2$$

$$= 986.96 \text{ cm/s}^2$$

$$= 9.8696 \text{ m/s}^2$$

$\therefore$ The acceleration due to gravity is 9.87 m/s^2 (1 mark)

(iv)

The value of x -axis is -10 cm . (1 mark)

(v)

$$\text{from } T^2 = \frac{4\pi^2}{g}x + \frac{4\pi^2}{g}b$$

$$0 = \frac{4\pi^2}{g}x + \frac{4\pi^2}{g}b$$

$$-x = b$$

$$-(-10) = b$$

$$b = 10 \text{ cm}$$

The significance of x -intercept is to determine the value of the knot b which is 10 cm . (1 mark)

(vi)

$$T^2\text{-intercept} = 0.4 \text{ sec}^2 \quad (1 \text{ mark})$$

(vii)

$$\text{Again from } T^2 = \frac{4\pi^2}{g}x + \frac{4\pi^2}{g}b$$

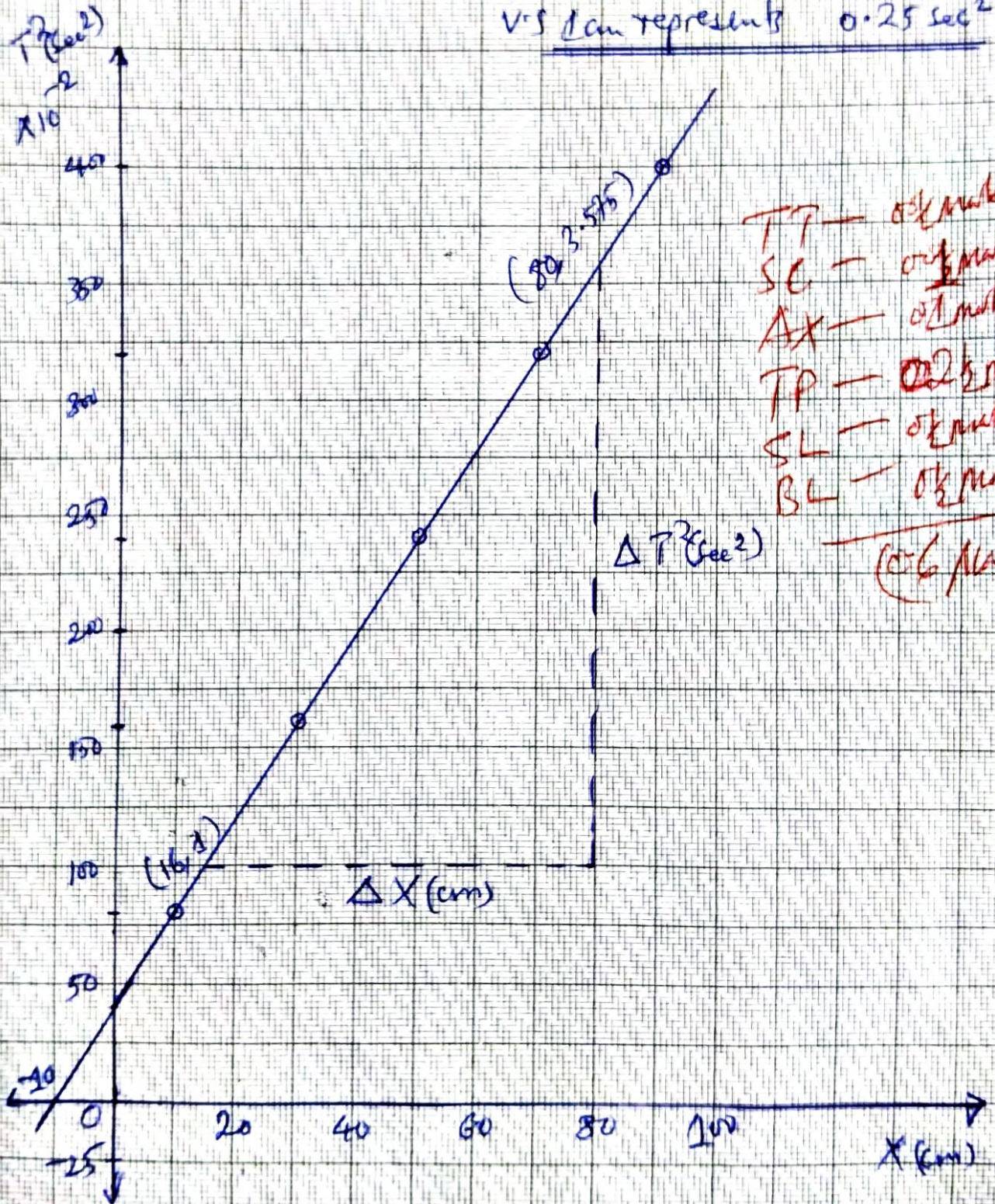
$$y = mx + c$$

$$\text{Then } Y^0 = \frac{4\pi^2}{g}b \text{ Hence shown} \quad (1 \text{ mark})$$

THE GRAPH OF $T^2(\text{sec}^2)$ AGAINST $X(\text{cm})$

Scale 'HS' 1cm represents 10 cm

V.S 1cm represents 0.25 sec²



TT — 0.5 mark
 SC — 0.5 mark
 AX — 0.5 mark
 TP — 0.5 mark
 SL — 0.5 mark
 BL — 0.5 mark
 (0.6 marks)

1 (e) (vii)

$$\text{from } Y^0 = \frac{4\pi^2 b}{g}$$

$$b = \frac{g Y^0}{4\pi^2}$$

$$= \frac{9.87 \times 0.04}{4 \times 9.87}$$

$$= \frac{0.4}{4}$$

$$= 0.1 \text{ m}$$

$$= 10 \text{ cm}$$

(01 mark)

$\therefore$ the value of b is 10 cm.

(ix)

Sources of errors

- Large displacement angle
- Time reaction
- Prevailing wind (Air resistance)

(01 mark)

2

(h) Table of values

Angle of incidence i	$\sin i$	$\sin^2 i$	L (cm)	L^2 (cm ²)	$\frac{1}{L^2}$ (cm ⁻²)
25	0.4226	0.1786	5.4	29.16	0.0343
35	0.5736	0.3290	5.6	31.36	0.0318
45	0.7071	0.5000	5.9	34.81	0.0287
55	0.891	0.6710	6.2	38.44	0.0260
65	0.903	0.8214	6.5	42.25	0.0237

(2 marks)

Total
(20 marks)

(e) The graph.

(f) Slope (S) = $\frac{\Delta \sin^2 i}{\Delta \frac{1}{L^2} \text{ cm}^{-2}}$ (0.5 mark)

$$= \left(\frac{1.8 - 0.3}{0.0075 - 0.03225} \right)$$

$$= -60.61 \text{ cm}^2$$

$\therefore$ The slope of the graph is -60.61 cm^2

(0.5 mark)

From the graph.

$$C_1 = \sin^2 i \quad (0.5 \text{ mark})$$

$$= 2.25$$

$\therefore$ The intercept is 2.25 (0.5 mark)

2 (K)

$$\eta = \sqrt{G}$$

(0.5 mark)

$$= \sqrt{2.25}$$

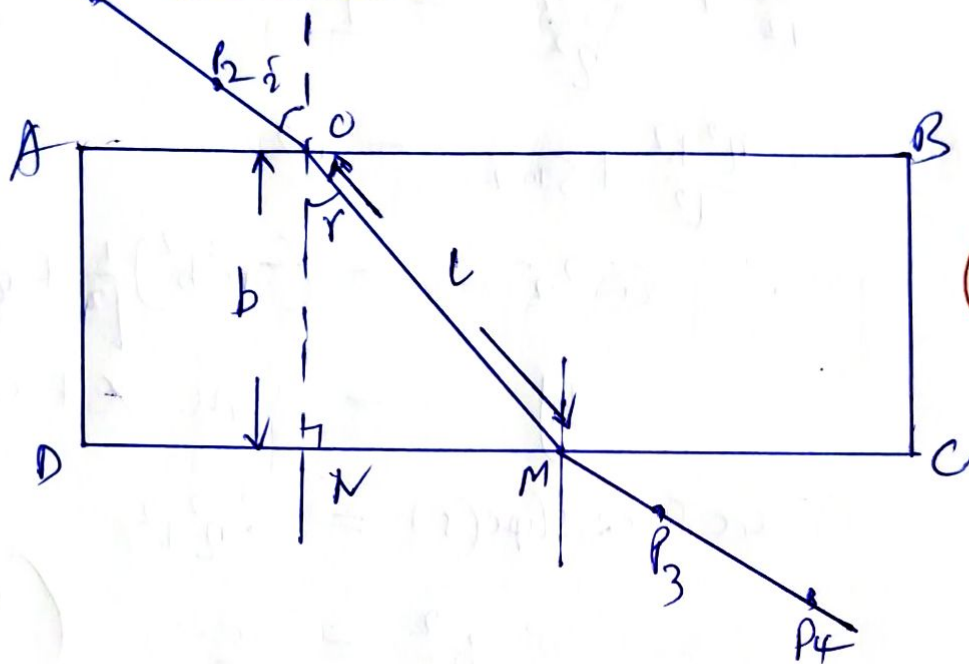
$$= 1.5$$

(0.5 mark)

$\therefore$ The value of refractive index

$$\text{is } \underline{1.5}.$$

(1)



(0.5 marks)

From the Pythagoras theorem.

$$b^2 + \overline{NM}^2$$

$$= l^2$$

$$\text{--- (2) (0.5 mark)}$$

$$\text{But } \sin r$$

$$= \frac{\overline{NM}}{l}$$

$$\overline{NM}$$

$$= l \sin r$$

$$\text{--- (i)}$$

$$\text{Again refractive index, } \eta = \frac{\sin i}{\sin r}$$

$$\sin r$$

$$= \frac{\sin i}{\eta}$$

$$\text{--- (iii)}$$

Substitute

$$\sin r$$

$$= \frac{\sin i}{\eta} \text{ into eqn (i)}$$

$$\overline{NM}$$

$$= \frac{l \sin i}{\eta}$$

(0.5 mark)

2 (1)

Squaring both sides

$$nm^2 = \frac{l^2 \sin^2 i}{\eta^2} \quad \text{the substitute in eqn (2)} \quad (\text{0.5 mark})$$

$$b^2 + \frac{l^2 \sin^2 i}{\eta^2} = l^2$$

$$\frac{b^2}{l^2} + \frac{\sin^2 i}{\eta^2} = 1$$

$$\frac{\eta^2 b^2}{l^2} + \sin^2 i = \eta^2$$

$$\sin^2 i = \left(\frac{\eta^2 b^2}{l^2} \right) \frac{1}{\eta^2} + \eta^2 \quad (\text{0.5 mark})$$

$$y = mx + c$$

$$\text{Therefore: slope}(s) = -\eta^2 b^2$$

$$b^2 = \frac{-s}{\eta^2} \quad (\text{0.5 mark})$$

$$b = \sqrt{\frac{-s}{\eta^2}} \left(\frac{\sqrt{-s}}{\eta} \right)$$

$$= \frac{\sqrt{-(-60.61) \text{ cm}^2}}{1.5}$$

$$= \frac{7.7853}{1.5}$$

$$= 5.19$$

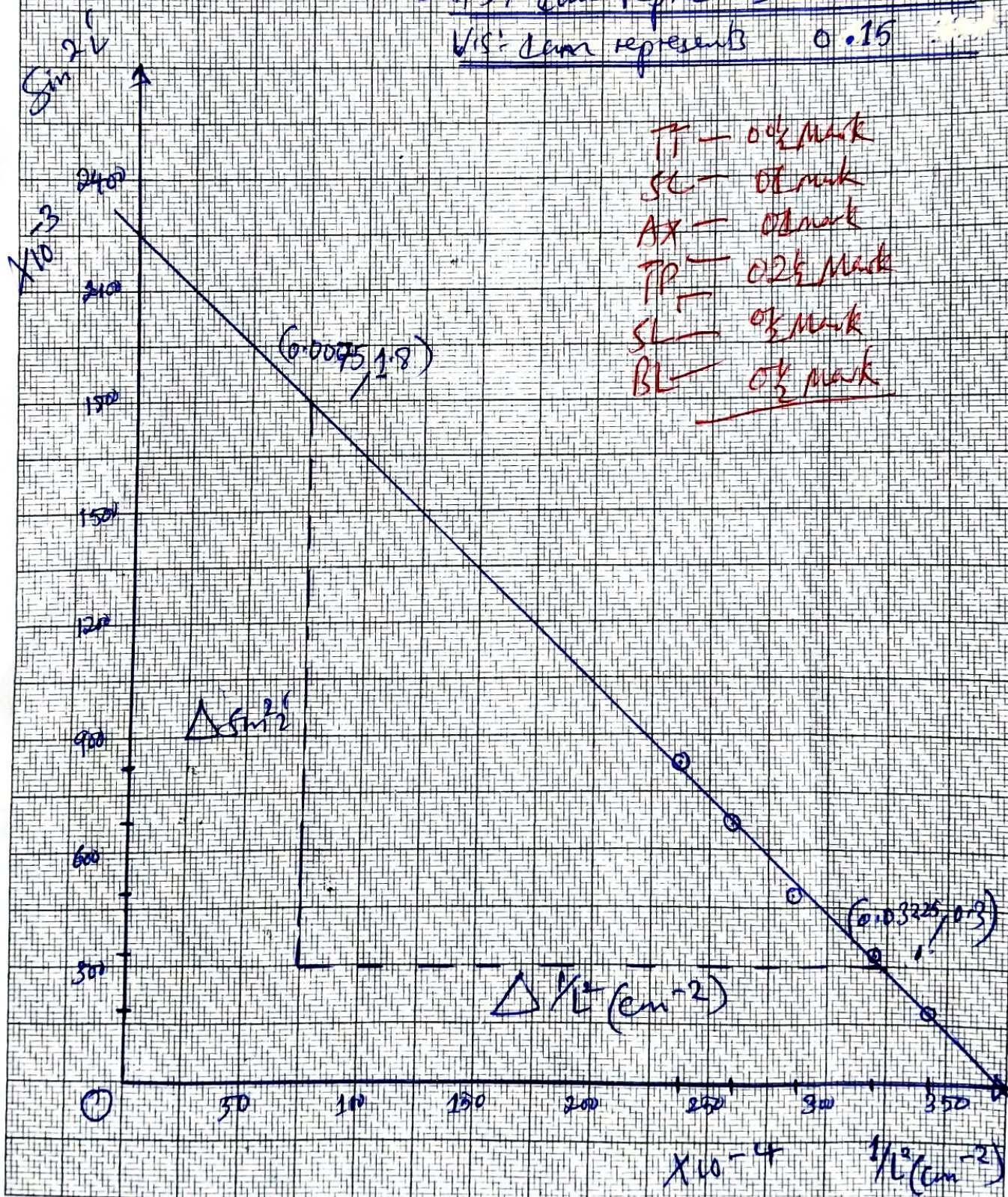
$$\approx 5.2 \text{ cm}$$

∴ The breadth of the glass block
is 6.67 cm. (0.5 marks)

Any relevant
diagram should
take 0.5 mark
Total (0.5 marks)

THE GRAPH OF $\sin^2 \theta$ AGAINST $1/L^2 (\text{cm}^{-2})$

Scale H.S: 1cm represents 0.0025 cm^{-2}
 V.S: 1cm represents 0.15



- TT — 0.5 mark
- SL — 0.5 mark
- AX — 0.5 mark
- TP — 0.25 mark
- SL — 0.5 mark
- BL — 0.5 mark