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

FORM SIX PRE-NATIONAL EXAMINATIONS 2026
131/3A PHYSICS 3A PRACTICAL
MARKING SCHEME

1. (c) (ii) Table of results

L(cm)	t(s)	T(s)	$T^2S(^2)$
0.90	21.30	1.07	1.14
0.80	20.08	1.00	1.00
0.70	18.78	0.94	0.88
0.60	17.39	0.87	0.76
0.50	15.87	0.79	0.63
0.40	14.20	0.71	0.50

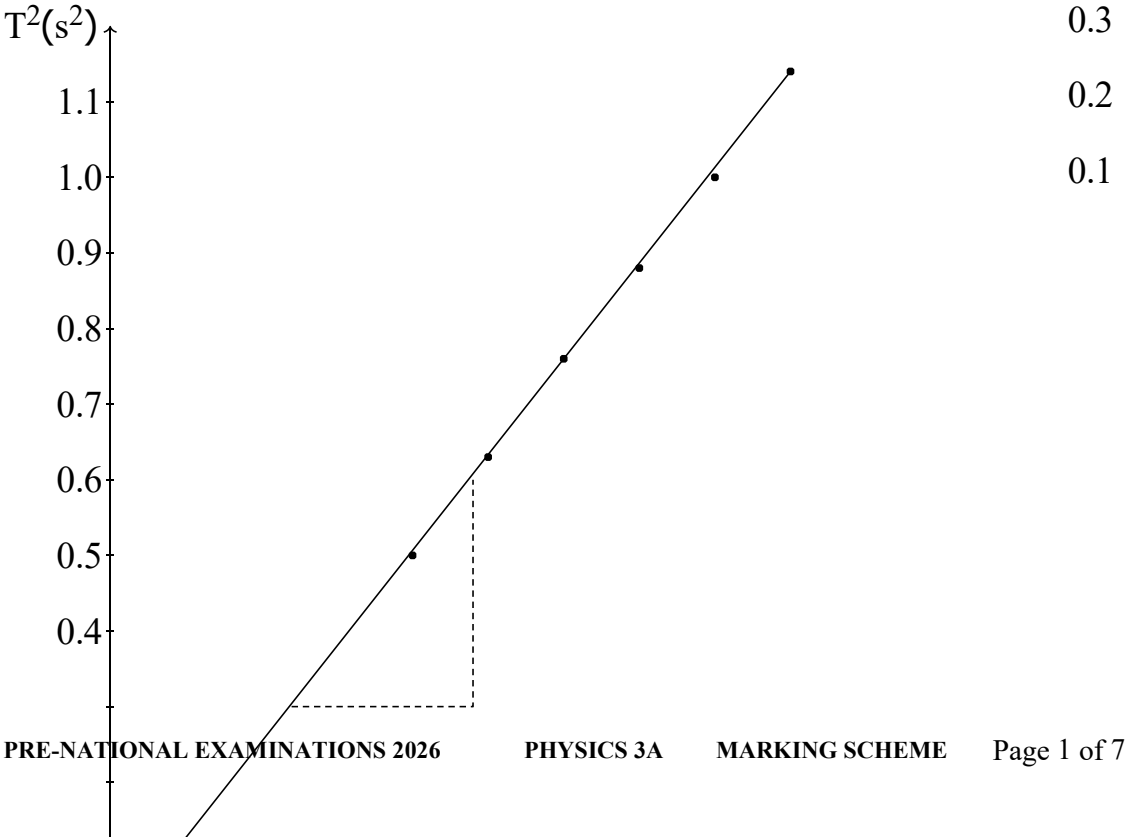
(05 marks)

(d) Mass of the bob= 26.8kg **(00½ marks)**

Radius of the bob= 9mm **(00½ marks)**

(e) (i) THE GRAPH OF T_S^2 AGAINST L(cm)

SCALE
V.S:1cm represent 0.1



H.S:1cm represent 0.1

TT=01
AX=01
SC=01
TP = 02
BL = 01
SI = 01

0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1
L(cm)

ii

$$\text{Slope} = \frac{\Delta T^2(s^2)}{\Delta L(m)} \quad (00\tfrac{1}{2}\text{ marks})$$

$$= \frac{(0.6-0.3)s^2}{(0.48-.24)m} \quad (\textbf{01 marks})$$

$$\text{slope} = 1.25 s^2 m^{-1} \quad (\textbf{01 marks})$$

(f) From

$$I = \frac{\eta a^4 T^2}{8\pi L}$$

$$T^2 = \frac{8\pi I}{\eta a^4} L \quad (00\tfrac{1}{2}\text{ marks})$$

$$y = mx + c$$

$$\text{slope} = \frac{8\pi I}{\eta a^4} \quad (00\tfrac{1}{2}\text{ marks})$$

$$\eta = \frac{8\pi I}{\text{slope} a^4}$$

Where

$$a = \text{radius of wire}$$

$$= \frac{0.27 \times 10^{-3}}{2}$$

$$a = 0.135 \times 10^{-3} m$$

$$I = 0.4 m^{-2} \quad (\textbf{01 marks})$$

$$\eta = \frac{8 \times \pi \times 0.4 \times 26.8 \times 10^{-3} \times (9 \times 10^{-3})^2}{1.25 \times (0.135 \times 10^{-3})^4} \quad (00\tfrac{1}{2}\text{ marks})$$

$$\eta = 5.256 \times 10^{10} N/m^2$$

$\therefore$Coefficient of rigidity is $5.256 \times 10^{10} N/m^2$ (**01 marks**)

(e) Sources of errors

(i) Time reaction in starting or stopping stopwatch

(ii) Air resistance. (**01 marks**)

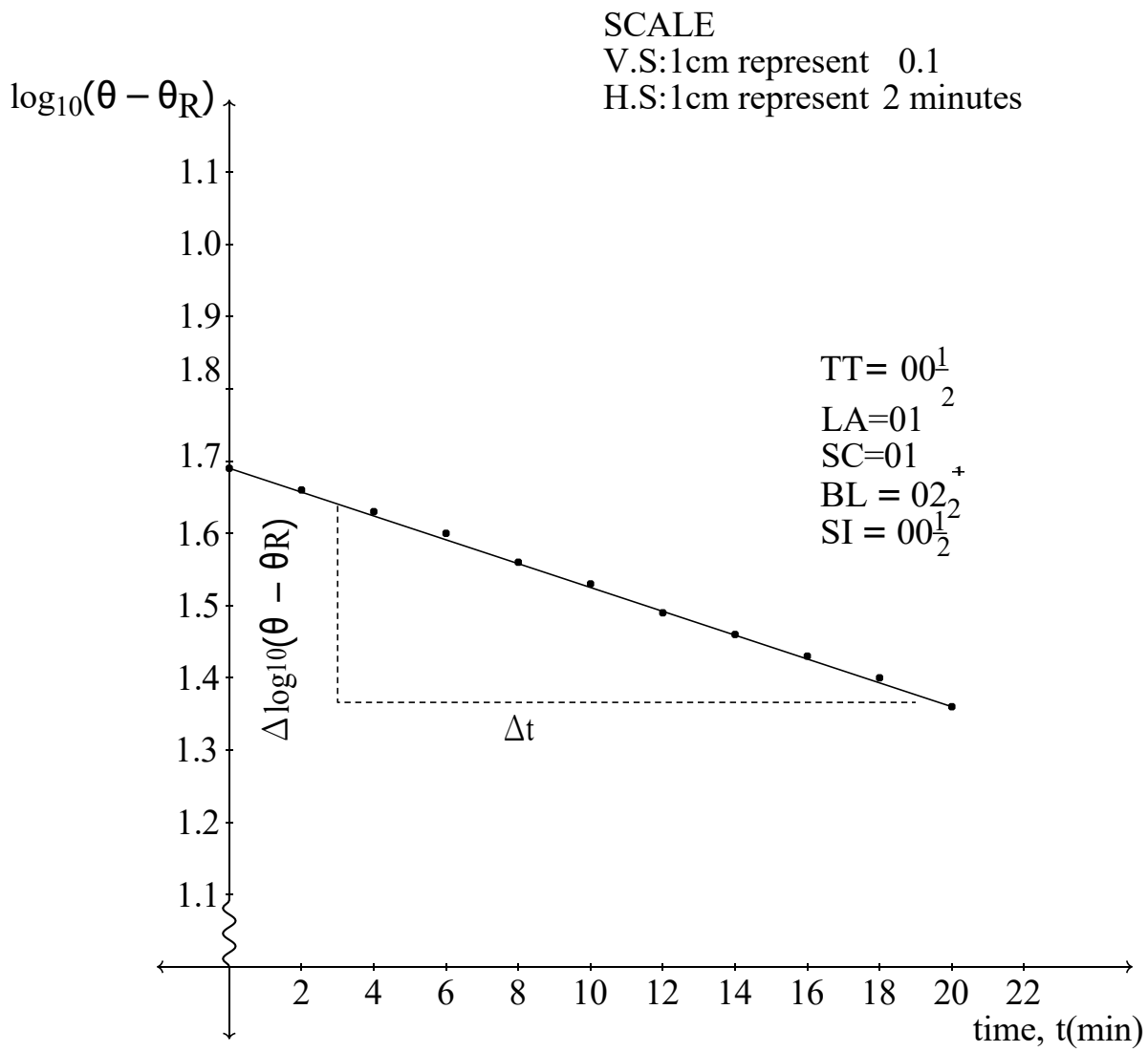
2. Room temperature, $\theta_R = 30^{\circ}C$

(i) Table of results

t(min)	$\theta(^{\circ}C)$	$(\theta - \theta_R)^{\circ}C$	$\log_{10}(\theta - \theta_R)$
0	80	50	1.69
2	76	46	1.66
4	73	43	1.63
6	70	40	1.60
8	66	36	1.56
10	64	34	1.53
12	61	31	1.49
14	59	29	1.46
16	57	27	1.43
18	55	25	1.40
20	53	23	1.36

(06 marks)

(ii) THE GRAPH OF $\log_{10}(\theta - \theta_R)$



(iii) From the graph,

$$\text{slope} = \frac{\Delta\log_{10}(\theta - \theta_R)}{\Delta t}$$

$$= \frac{1.638 - 1.365}{(3 - 19)min}$$

$$\text{slope} = -0.017min^{-1} \textbf{(01 marks)}$$

$$\log_{10}(\theta - \theta_R) - \text{intercept} = 1.69$$

$$\log_{10}(\theta - \theta_R) = -0.017t + 1.690 \textbf{(01 marks)}$$

$$y = mx + c$$

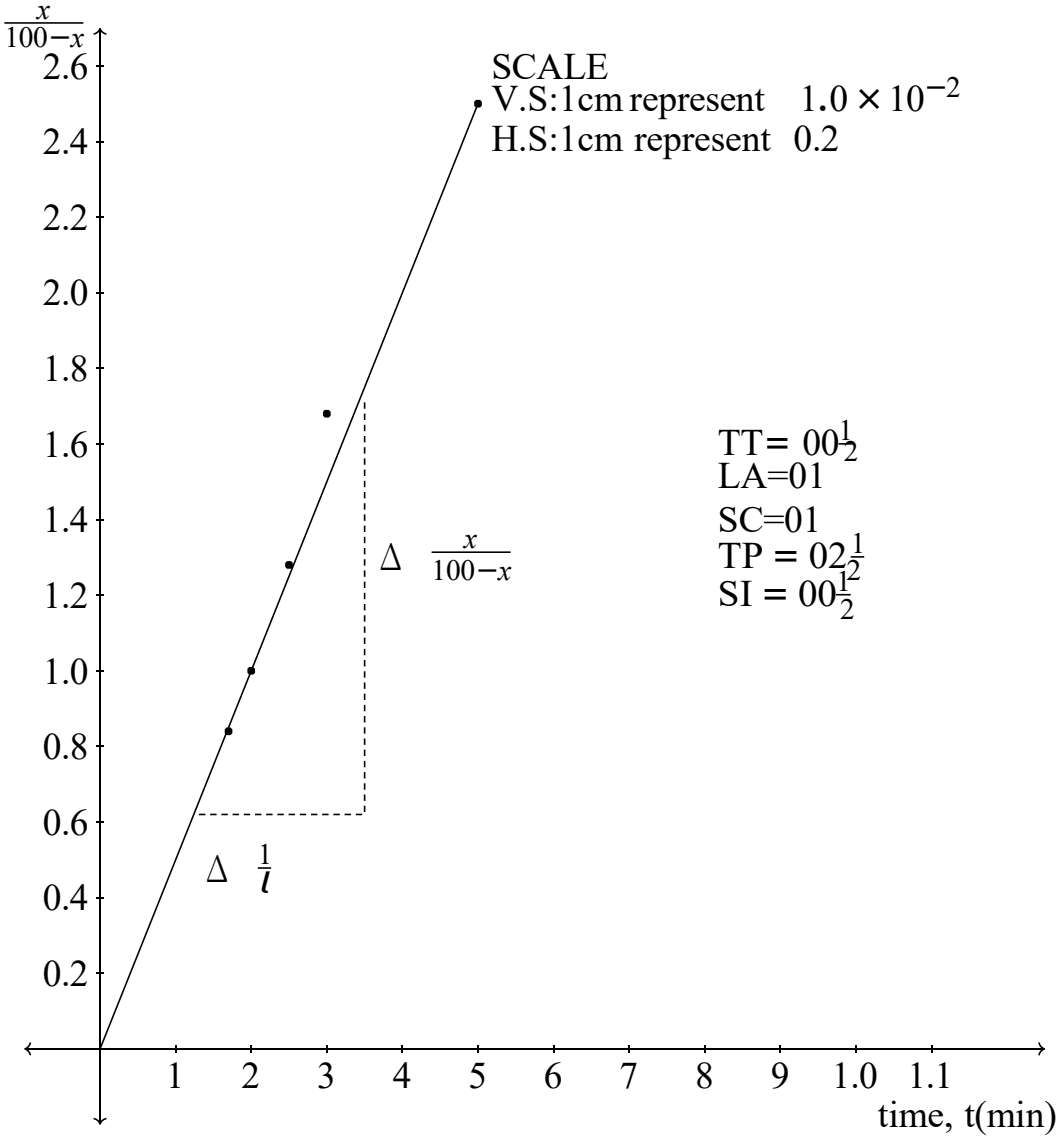
(iv) Newton's law of cooling **(01 marks)**

(v) Aim of the experiment is to verify Newton's law of cooling **($00\frac{1}{2}$ marks)**

3. (i) Table of results

l(cm)	x(cm)	$(100-x)$cm	$\frac{x}{100-x}$	$\frac{1}{l}(\text{cm}^{-1})$
20	71.4	28.6	2.50	0.05
30	62.5	37.5	1.67	0.03
40	55.6	44.4	1.28	0.025
50	50	50	1.00	0.02
50	45.5	54.4	0.83	0.017
	(02½ marks)		(02½ marks)	

(ii) A GRAPH OF $\frac{x}{100-x}$ AGAINST $\frac{1}{l}(\text{cm}^{-1})$



(iii) From the relation R∝l then

$$R_p \propto x$$
$$R_P = kx$$
$$R_Q = 100 - x$$
$$R_Q = k(100 - x)$$
$$\frac{R_p}{R_Q} = \frac{kx}{k(100 - x)}$$

But $R_p = 2\Omega(\quad)$ **00½ marks**

$$R_Q = \frac{\rho l}{A}$$
$$\frac{x}{100 - x} = \frac{2A}{\rho}\frac{1}{l}$$ **(01 marks)**

(iv)

$$\text{slope} = \frac{2A}{\rho}$$

Where ρ resistivity of the wire Q hence,

$$\rho = \frac{2\pi A}{\text{slope}}$$
$$\text{slope} = \frac{\Delta \frac{x}{100-x}}{\Delta \frac{1}{l}\ cm^{-1}}$$
$$\text{slope} = \frac{1.76 - 0.64}{(0.035 - 0.0125)cm^{-1}}$$ **(01 marks)**
$$\rho = \frac{2 \times 1.13 \times 10^{-7}}{0.4978}\ \pi\Omega$$
$$\rho = 4.6 \times 10^{-7}\pi m$$

Range of $\rho(4.6 - 5.2) \times 10^{-7}\pi m$ **(01 marks)**

(v) The aim of the experiment is to determine the resistivity of the wire labeled Q **(00½ marks)**

(v) Diameter of the wire Q, d= 0.38mm. **(00½ marks)**