Kenya Certificate of Secondary Education

PHYSICS (PRACTICAL) Paper 3

TIME: 2 ½ HOURS

Instructions

- *Write your name and index number in the spaces provided above.*
- *Sign and write the date of examination in the spaces provided above.*
- *Answer ALL questions in the spaces provided in the question paper.*
- *You are supposed to spend the first 15 minutes of the 2 ½ hrs allowed for this paper reading the whole paper carefully before commencing your work.*
- *Marks are given for a clear record of the observations actually made, their suitability, accuracy and the use made of them.*
- *Candidates are advised to record their observations as soon as they are made.*
- *Non-programmable silent electronic calculators and KNEC mathematical tables may be used except where stated otherwise.*
- *This paper consists of 7 printed pages.*
- *Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.*

For Examiner's Use Only

Question 1	c	d	g	h	i	(j)	(k)		**TOTAL**
Maximum Score	1	1	8	5	2	2	1		**20**
Candidate's Score									

Question 2		c	e	f	g	h	i	j	k	**TOTAL**
Maximum Score		1	6			5	3	3	2	**20**
Candidate's Score										

GRAND TOTAL

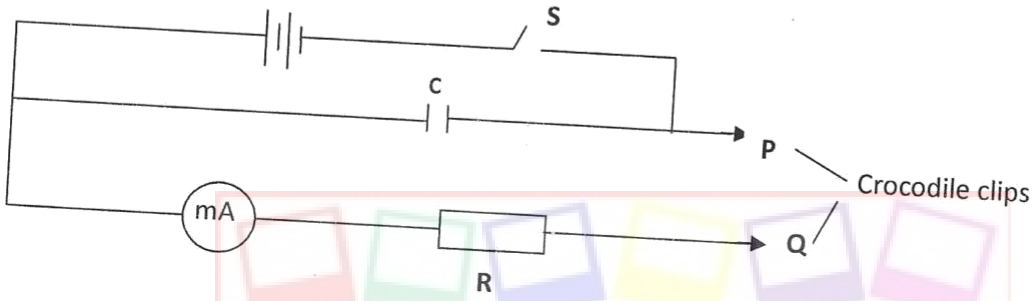
Question one

You are provided with the following:

- 2 new dry cells size D
- A cell holder
- A switch
- A millimeter of range 0 to 1 mA
- A capacitor labeled C
- 8 connecting wires; at least four with crocodile clips on one end
- A stopwatch
- A carbon resistor labeled **R**

Proceed as follows

a. Connect the circuit as shown in the **figure 1**below, where **P** and **Q** are crocodile clips.



b. Close the switch **S**

c. Name the process which takes place when the switch **S** is closed

.....charging. ✓1.....

(1 mark)

d. Connect the crocodile clips P and Q. Observe and record the highest reading of the millimeter $\mathbf{I_o}$

✓1

.....0.61 mA ±0.02.....

(1 mark)

e. Open the switch S and at the same time start the stopwatch to measure the time taken for the current to decrease to **four fifth** the value of $\mathbf{I_o}$ i.e. $^4/_5\ \mathbf{I_o}$. Record your value in the **table 1**.

f. Close the switch S for a second time and observe the deflection in the millimeter. ***(the pointer should rise back to the same initial value I_o)***

2

2

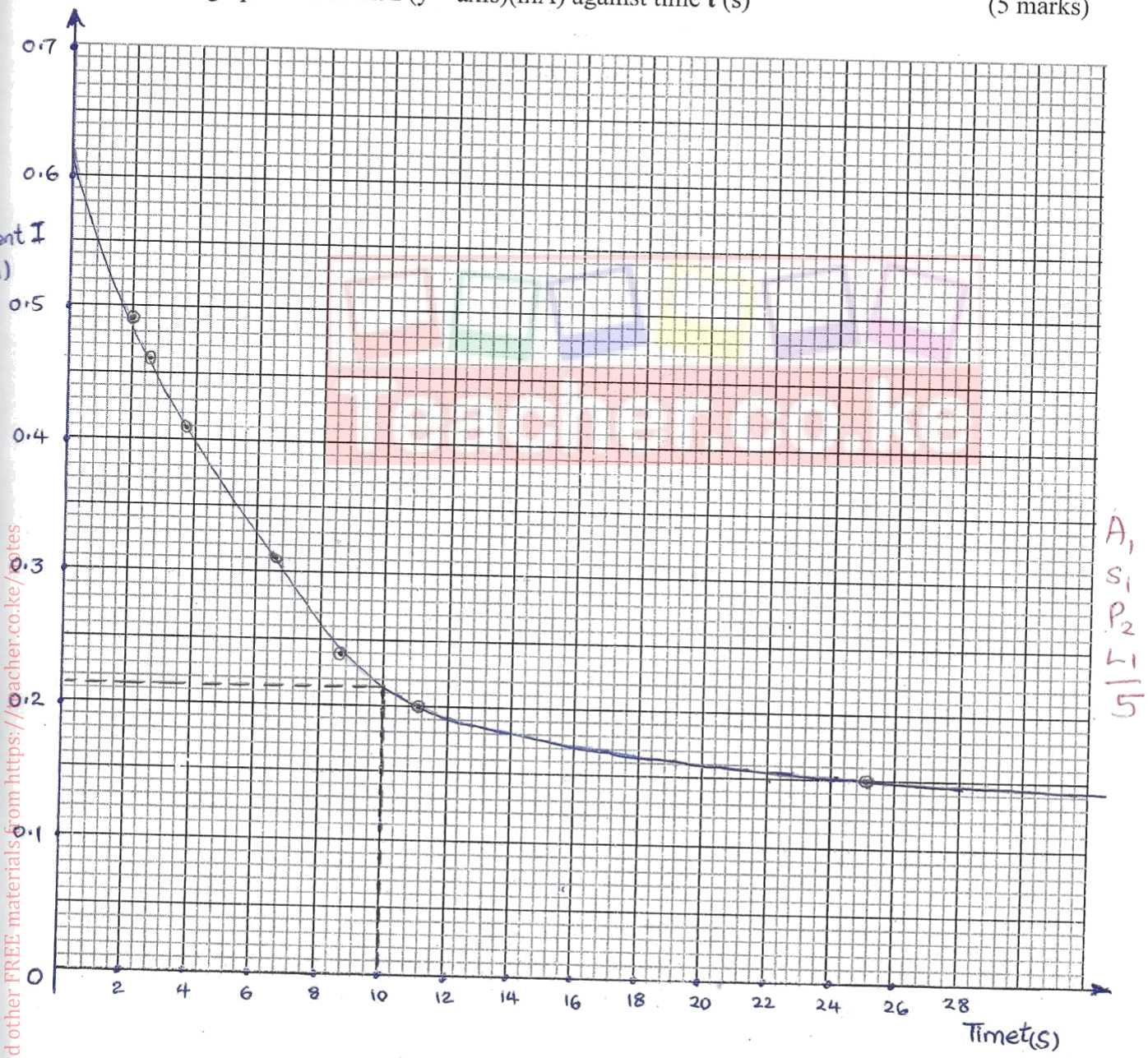
g. Repeat part (b) for other values of current as shown in the **table 1** below. (8 marks)

Current **I** (mA)	$^{4}/_{5}$ I_o	$^{3}/_{4}$ I_o	$^{2}/_{3}$ I_o	$^{1}/_{2}$ I_o	$^{2}/_{5}$ I_o	$^{1}/_{3}$ I_o	$^{1}/_{4}$ I_o
Your calculated fraction of I_o (mA)	0·49	0·46	0·41	0·31	0·24	0·20	0·15
Time **t** (s)	0·20 ✓1	0·26 ✓1	3·70 ✓1	6·58 ✓1	8·64 ✓1	11·04 ✓1	25·50 ✓1

± } ✓1

± 0·5

h. Plot a graph of Current **I** (y – axis)(mA) against time **t** (s) (5 marks)



A1 S1 P2 L1 /5

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i. From your graph, find **W** the value of **I** when **t = 10s**. (2 marks)

$W = 0.23\ mA$ ✓1

(Confirm this value from graph) ✓1

j. Given that **A = 10W**, determine the value of **A.** (2 marks)

$A = 10 \times 0.23 \times 10^{-3}$ ✓1

$= 2.3 \times 10^{-3}\ C$ ✓1

k. Determine the voltage across **R** at **t = 10s** given that R = 4.7kΩ (1 mark)

$V = IR$

$= 2.3 \times 10^{-4} \times 4.7 \times 10^{3}$

$= 1.081\ V$ ✓1

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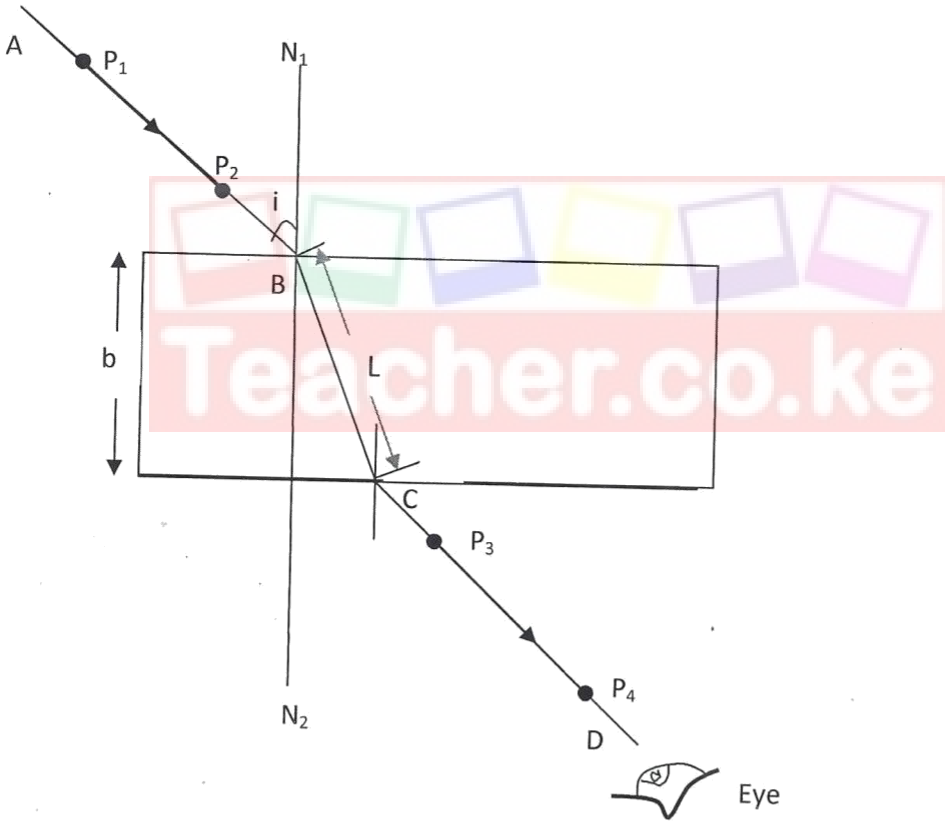
Question Two

You are provided with the following;

- a rectangular glass block
- 4 optical pins
- 2 thumb pins
- a soft board
- a plain paper

Proceed as follows:

(a) Place the glass block on the plain paper with one of the largest face upper most. Trace round the glass block using a pencil as shown below.

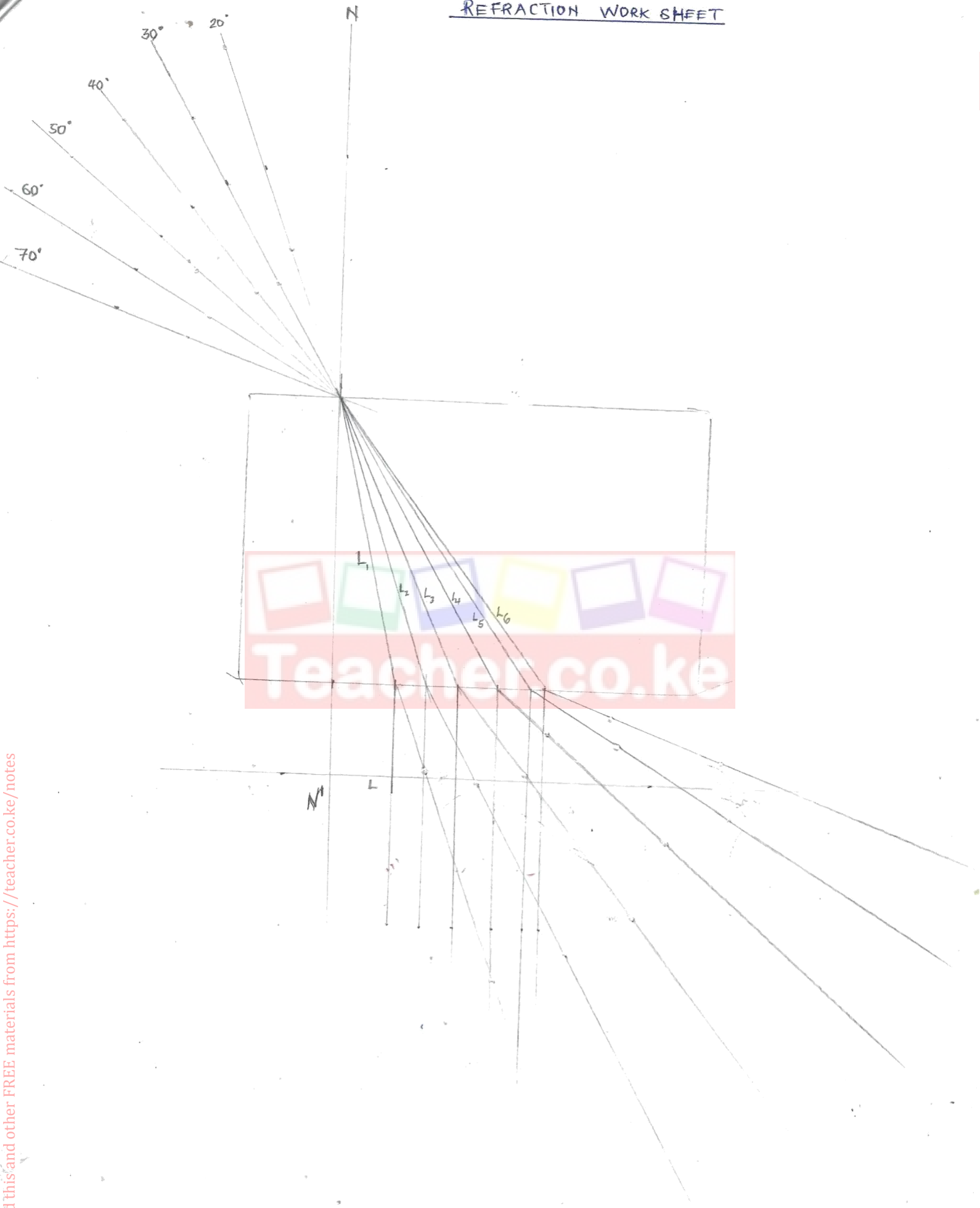


(b) Remove the glass block and construct a normal at B. Construct an incident ray AB of angle of incidence, i = 20^0.

(c) Measure the breadth **b** of the glass block (1 mark)

6.0 cm ±0.2

REFRACTION WORK SHEET



(c) Replace the glass block and trace the ray ABCD using the optical pins.

(d) Remove the glass block and draw the path of the ray ABCD using a pencil.

(e) Measure the length L and record it in the table below

Angle i^0	L (cm)	L^2 $(cm)^2$	$\frac{1}{L^2}$ (cm^{-2})	$Sin^2 i$
20	6·2 ½	38·44	0·0260	0·1170
30	6·4 ½	40·96	0·0244	0·25
40	6·7 ½	44·89	0·0223	0·4132
50	7·1 ½	50·41	0·0198	0·5868
60	7·4 ½	54·76	0·0183	0·75
70	7·6 ½	57·76	0·0173	0·8830

(6 marks)

(f) Repeat the procedure above for the angles of incidence given.

(g) Calculate the values of $\frac{1}{L^2}$ and $Sin^2 I$; and record in the table above.

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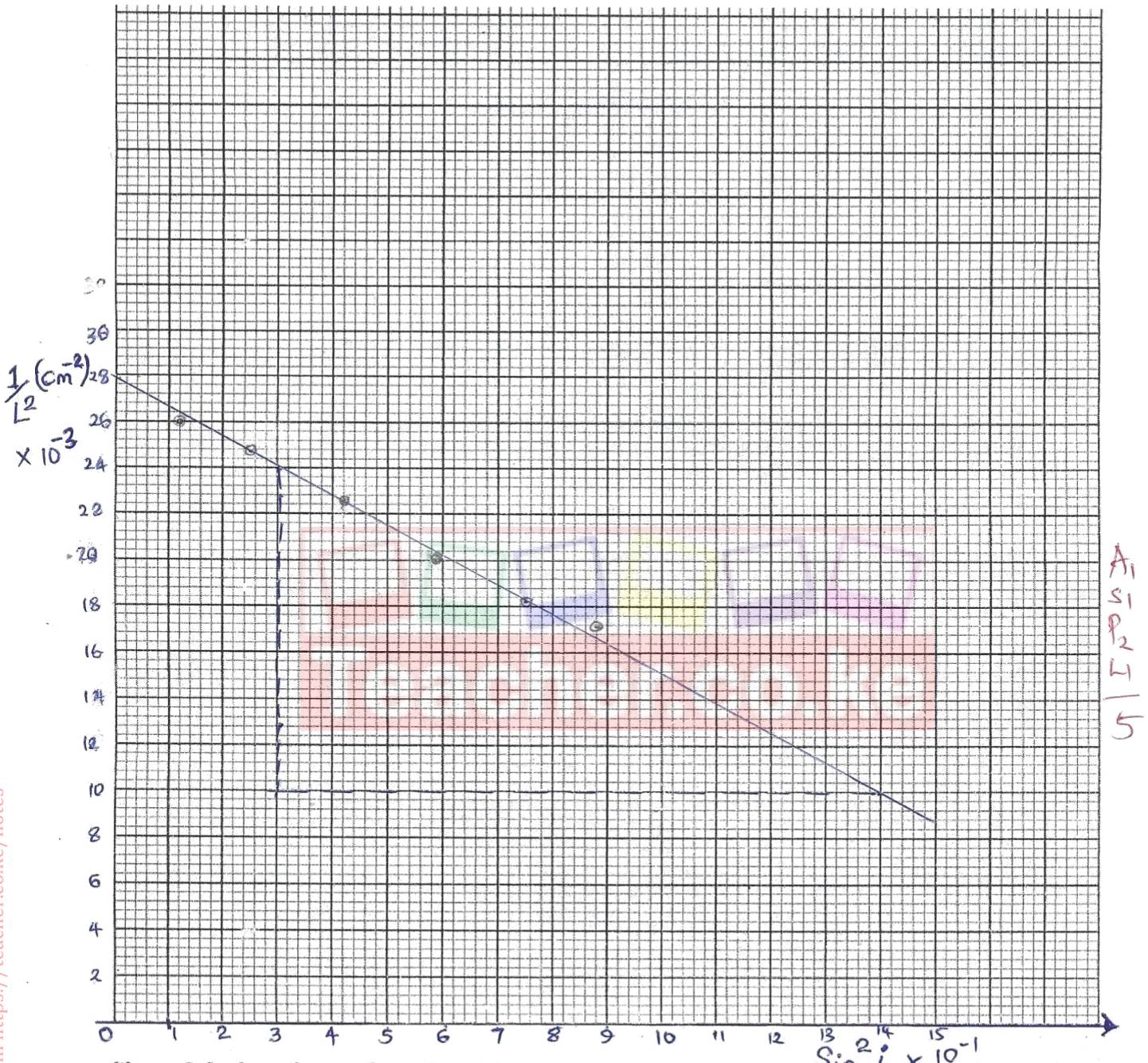
(h) Plot a graph of $\frac{1}{L^2}$ (y-axis) against Sin^2i. **(5 marks)**



A1 S1 P2 L1 /5

(i) Calculate the gradient **S** of the graph **(3 marks)**

$$\text{Slope} = \frac{\Delta 1/L^2}{\Delta \sin^2 i} = \frac{(24-10)\times 10^{-3}}{(14-3)\times 10^{-1}} = \frac{0.14}{1.1}$$

$$= 0.0127272 \text{ cm}^{-2}$$

Given that the equation of that graph is; $\frac{1}{L^2} = \left[\frac{1}{n^2b^2}\right] \text{Sin}^2 i + \frac{1}{b^2}$

(j) Determine the value of ***n*** (3 marks)

Gradient $= 0.0127272 = \frac{1}{n^2b^2}$ ✓1

but $b = 6.0\,cm$

$\therefore 0.0127272 = \frac{1}{n^2 \times 36}$ ✓1

$\frac{1}{n^2} = 0.0127272 \times 36$

$\frac{1}{n^2} = 0.4581812$

$n^2 = 2.18254$

$n = \sqrt{2.18254} = 1.47734$ ✓1

(k) Present your work sheet; attached to the exam paper (2 mark)

Confirm that the student ✓1 presents a correctly worked ✓1 diagram.

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