

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

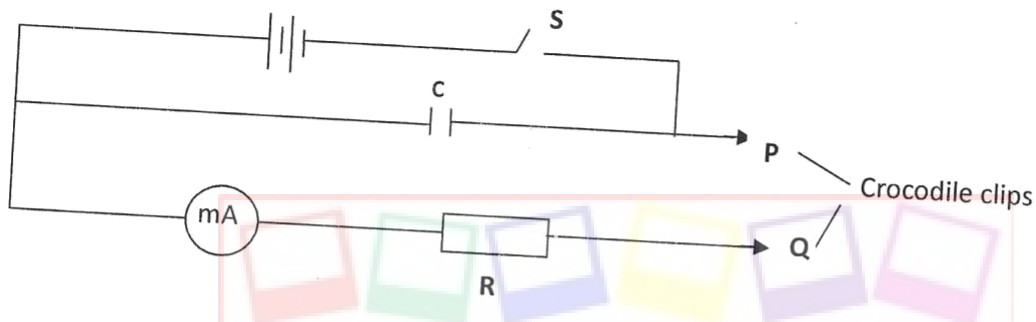
Question one

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 mark)

- d. Connect the crocodile clips P and Q. Observe and record the highest reading of the millimeter I_0

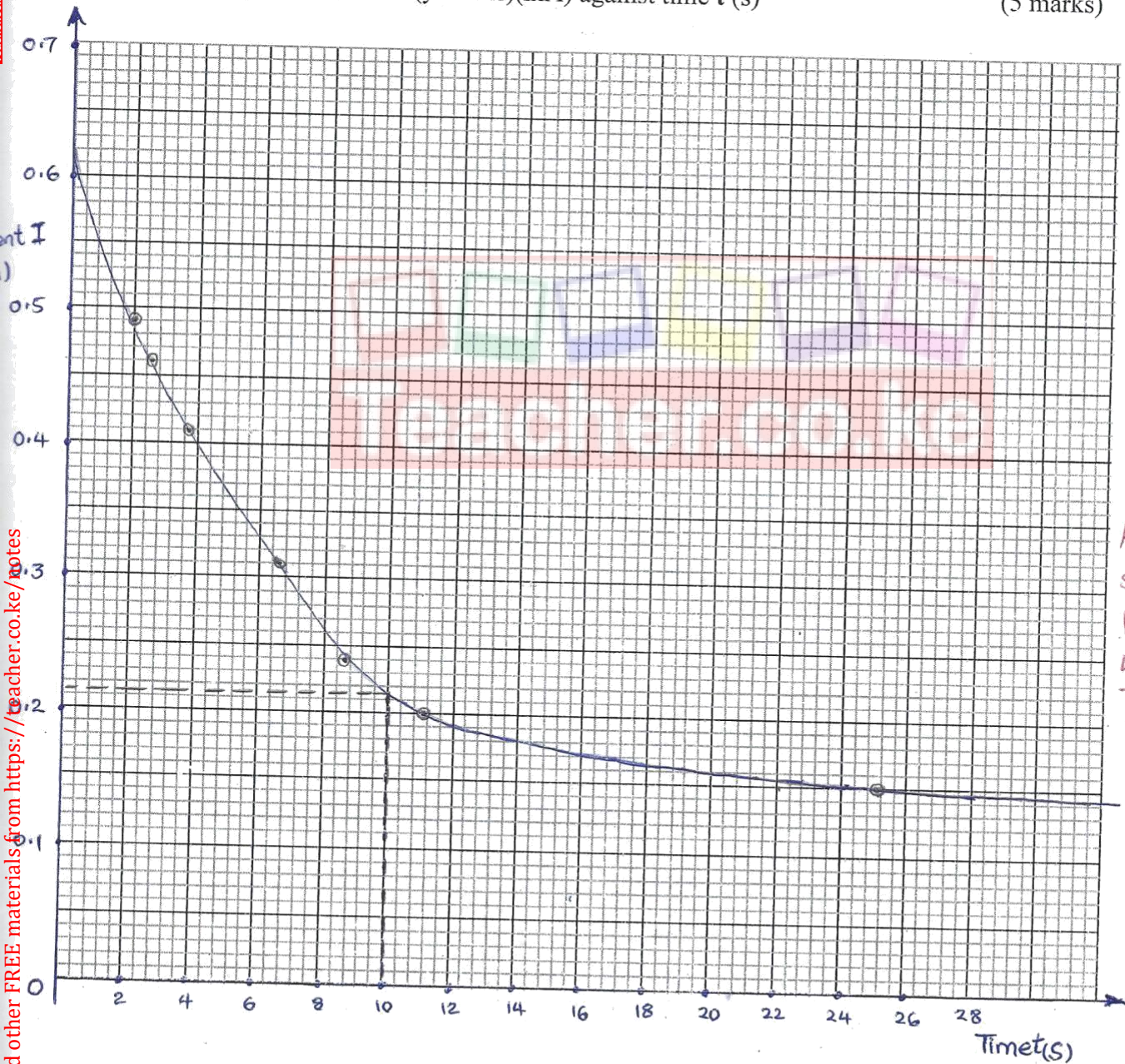
..... 0.61 mA ± 0.02 ✓ (1 mark)

- 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 I_0 i.e. $\frac{4}{5} I_0$. 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_0*)

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

Current I (mA)	$\frac{4}{5} I_0$	$\frac{3}{4} I_0$	$\frac{2}{3} I_0$	$\frac{1}{2} I_0$	$\frac{2}{5} I_0$	$\frac{1}{3} I_0$	$\frac{1}{4} I_0$	
Your calculated fraction of I_0 (mA)	0.49	0.46	0.41	0.31	0.24	0.20	0.15	$\pm \}$ ✓
Time t (s)	0.20 ✓	0.26 ✓	3.70 ✓	6.58 ✓	8.64 ✓	11.04 ✓	25.50 ✓	± 0.5

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



A, S, P, L, 5

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

$$W = 0.23 \text{ mA} \quad \checkmark$$

(Confirm this value from graph) \checkmark

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


$$A = 10 \times 0.23 \times 10^{-3} \quad \checkmark$$

$$= 2.3 \times 10^{-3} \text{ C} \quad \checkmark$$

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

$$V = IR$$

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

$$= 1.081 \text{ V} \quad \checkmark$$


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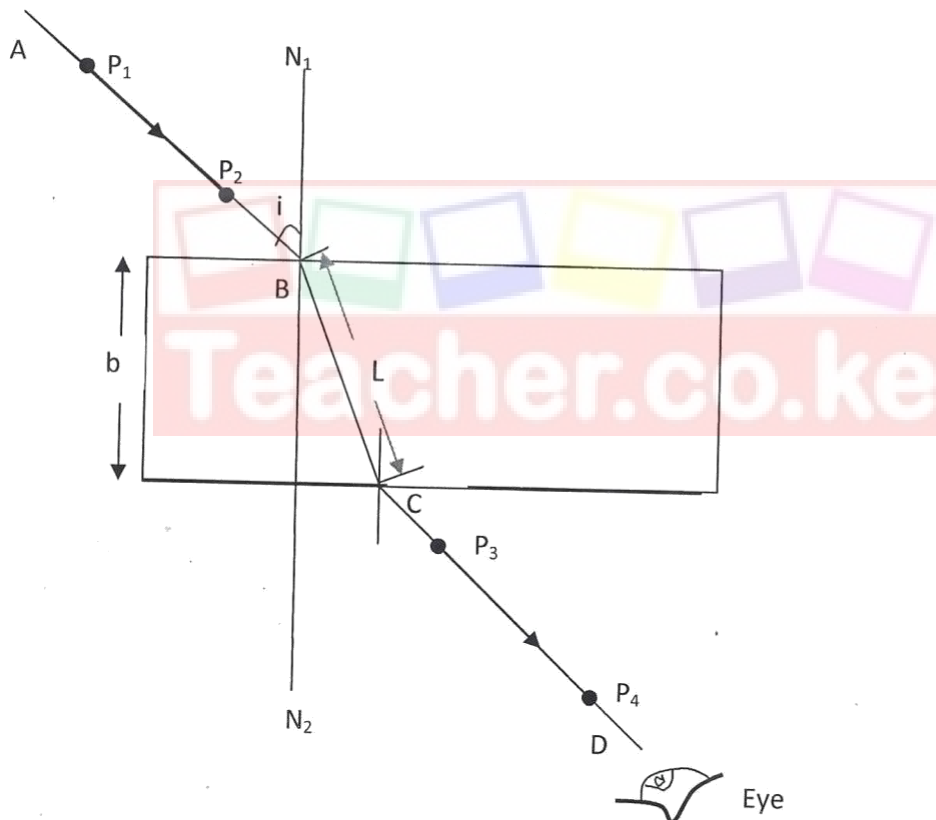
Question Two

You are provided with the following;

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

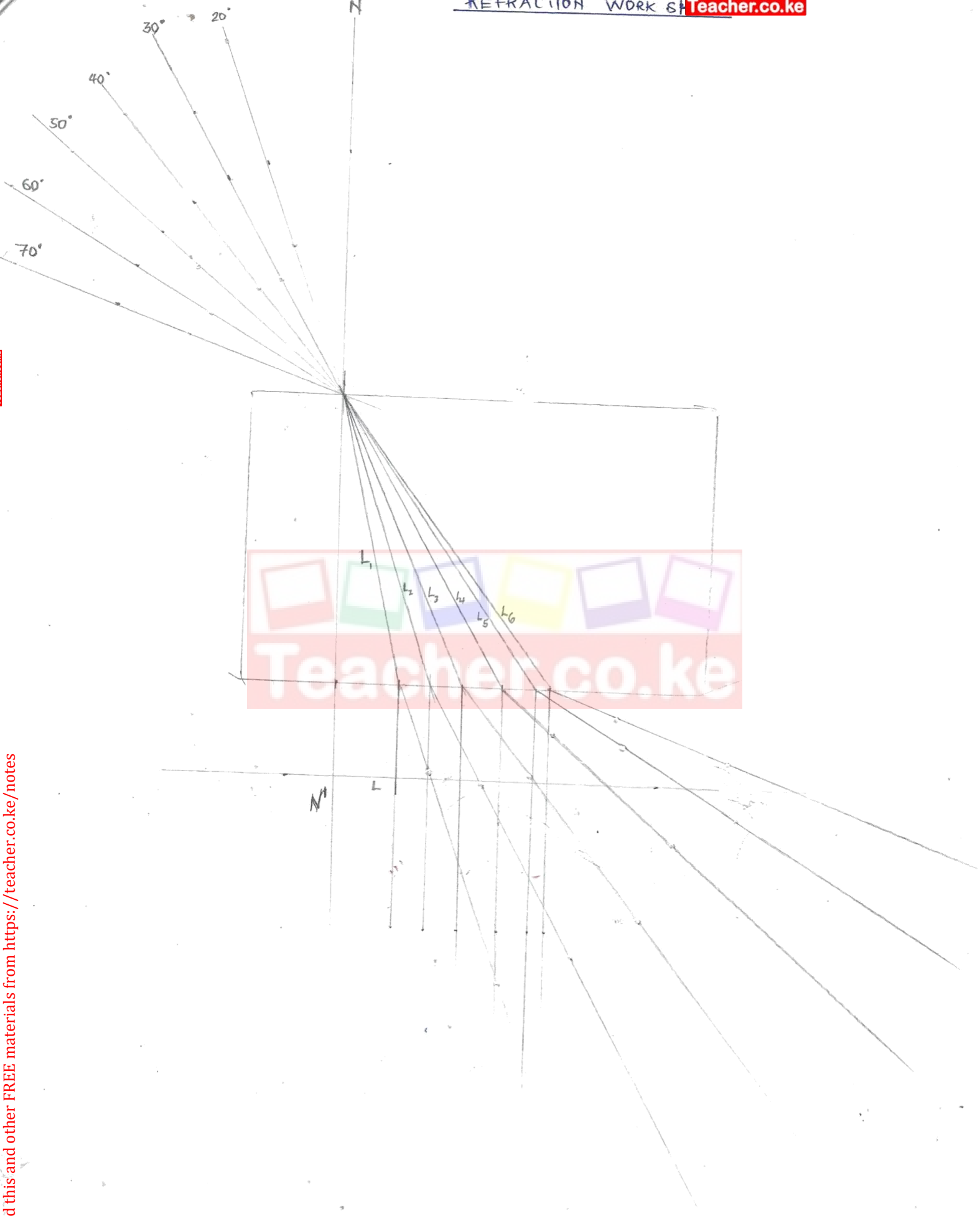
Proceed as follows:

- (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, $i = 20^\circ$.
- (c) Measure the breadth **b** of the glass block (1 mark)

..... 6.0 cm ± 0.2 ✓



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- (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°	L (cm)	L^2 (cm) ²	$\frac{1}{L^2}$ (cm ⁻²)	$\text{Sin}^2 i$
20	6.2 ✓ ₂	38.44	0.0260	0.1170
30	6.4 ✓ ₂	40.96	0.0244	0.25
40	6.7 ✓ ₂	44.89	0.0223	0.4132
50	7.1 ✓ ₂	50.41	0.0198	0.5868
60	7.4 ✓ ₂	54.76	0.0183	0.75
70	7.6 ✓ ₂	57.76	0.0173	0.8830

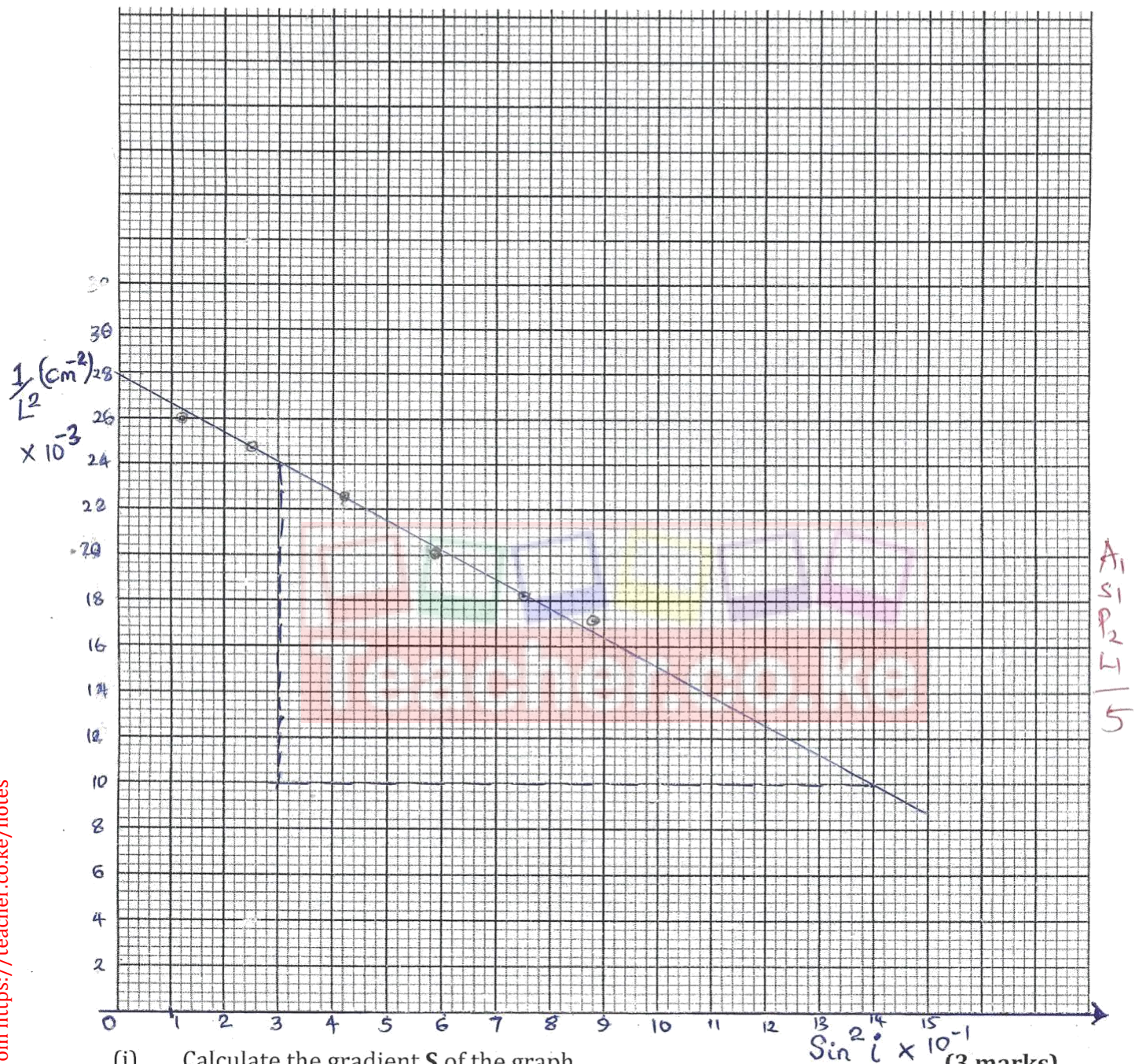
- (f) Repeat the procedure above for the angles of incidence given. (6 marks)

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

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

(5 marks)



A
S
P
E
S

(i) Calculate the gradient S of the graph

$\sin^2 i \times 10^{-1}$ (3 marks)

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

$$= 0.0127272 \text{ cm}^{-2} \sqrt{1}$$

Given that the equation of that graph is; $\frac{1}{L^2} = \left(\frac{1}{n^2 b^2} \right) \sin^2 i + \frac{1}{b^2}$

(j) Determine the value of n

(3 marks)

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

but $b = 6.0 \text{ cm}$

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

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

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

$$n^2 = 2.18254$$

$$n = \sqrt{2.18254} = 1.47734 \checkmark$$

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

(2 mark)

Confirm that the student
Presents a correctly worked
diagram.

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