THE KENYA NATIONAL EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education

232/3 — **PHYSICS** — Paper 3

(PRACTICAL)

Apr. 2021 – 2½ hours

Name .... Index Number ....

Candidate's Signature .... Date ....

Instructions to candidates

(a) Write your name and index number in the spaces provided above.

(b) Sign and write the date of examination in the spaces provided above.

(c) Answer **all** the questions in the spaces provided in the question paper.

(d) You are supposed to spend the first **15 minutes** of the 2½ hours allowed for this paper reading the whole paper carefully before commencing your work.

(e) Marks are given for a clear record of the observations made, their suitability, accuracy and use.

(f) Candidates are advised to record their observations as soon as they are made.

(g) **Non-programmable** silent electronic calculators and KNEC mathematical tables may be used.

(h) This paper consists of 8 printed pages.

(i) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

(j) Candidates should answer the questions in English.

For Examiner's Use Only

Question 1	a	c	e	f	g(i)	g(ii)	h(i)	h(ii)	
Maximum Score	1	1	6	5	3	1	2	1	Total
Candidate's Score									

Question 2	c	d	e	f	j	k	
Maximum Score	7	2	3	1	5	2	Total
Candidate's Score							

Grand Total

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232/3

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Turn over

Question 1

You are provided with the following:

- two cells in a cell holder;
- a switch;
- a micrometer screw gauge;
- a nichrome wire mounted on a millimetre scale;
- a voltmeter;
- an ammeter;
- a jockey;
- connecting wires with crocodile clips.

Proceed as follows:

(a)   Using the micrometer screw gauge, measure and record the diameter d of the wire.

d = ... mm

d = ... m   (1 mark)

(b)   Set up the apparatus as shown in **Figure 1**.

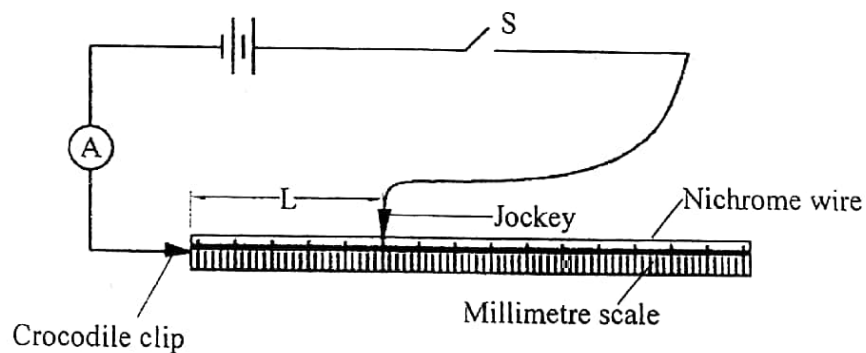**Figure 1**

(c)   Using the voltmeter, measure the potential difference E across the battery before closing the switch.

E = ... volts.   (1 mark)

(d)   Adjust the length L of the wire to 0.1 m (10 cm). Close the switch, read and record the value of the current I in **Table 1**.

(e)   Repeat (d) for the other values of L given in **Table 1**. Complete the table.   (6 marks)

Table 1

Length L (m)	0.1	0.2	0.3	0.4	0.5	0.6	0.7
Current I (A)							
$\frac{1}{I} A^{-1}$							

(f)   On the grid provided; plot the graph of $\frac{1}{I}$ (y axis) against L.   (5 marks)
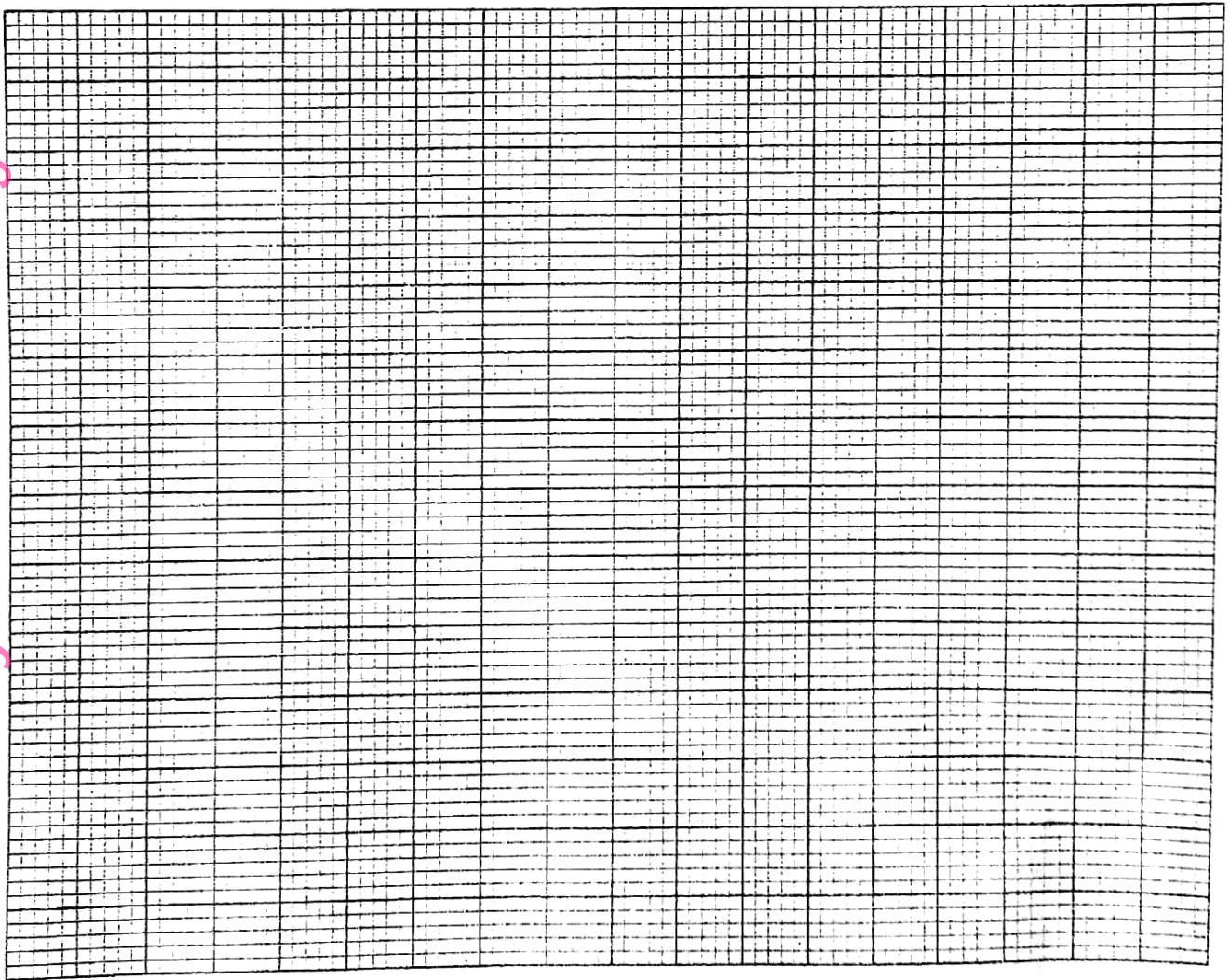
(g) From the graph, determine the:

    (i) gradient S;   (3 marks)

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    (ii) intercept C on the $\frac{1}{I}$ axis.   (1 mark)

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(h) Given that:

    (i) $\dfrac{4K_1}{\pi d^2 E} = S$ determine the value of K_1.   (2 marks)

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    (ii) $\dfrac{K_2}{E} = C$ determine the value of K_2.   (1 mark)

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Question 2

You are provided with the following:

- a metre rule;
- a biconvex lens;
- a source of light (bulb in a bulb holder, cells in a cell holder and a switch);
- a stand boss and clamp;
- a lens holder;
- a screen;
- a half metre rule;
- three pieces of plastic pipes A, B and C;
- a vernier callipers (to be shared);
- a stopwatch;
- some plasticine.

Proceed as follows

PART A

(a) Clamp the bulb holder onto the stand. Arrange the bulb, the lens and the screen along the metre rule as shown in **Figure 2**.
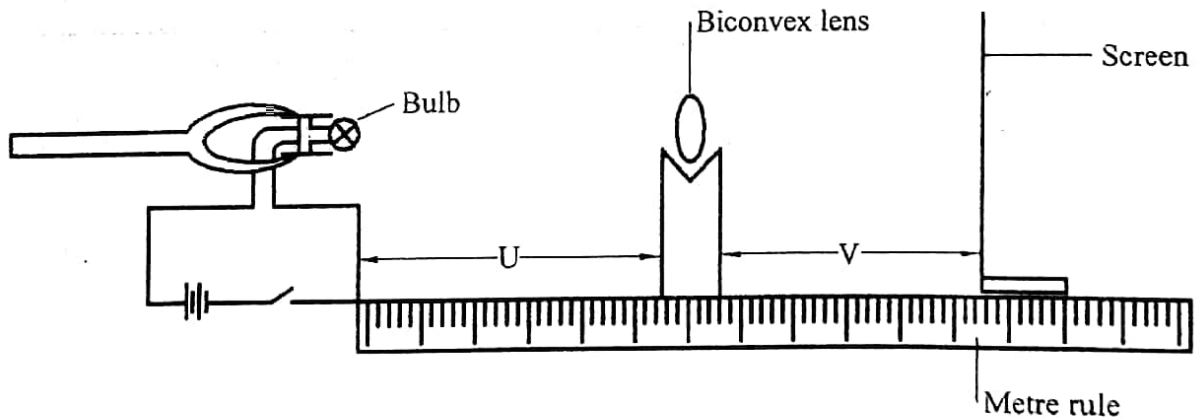

Figure 2

(b) Adjust the distance of the bulb from the lens to U = 25 cm. Put on the switch and adjust the position of the screen from the lens so that a sharp image of the bulb is observed. Record the distance V between the screen and the lens in **Table 2**.

(c) Repeat part (b) for the other values of U shown in **Table 2**. Complete the table. (7 marks)

Table 2

U cm	25	30	35
V cm			
$M = \dfrac{V}{U}$			
$F = \dfrac{V}{M+1}$			

(d) Determine the average value of F. (2 marks)

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PART B

(e) Using the vernier callipers measure and record the diameters of the three pipes.

d_A, d_B and d_C

$d_A =$ .... cm .... m (1 mark)

$d_B =$ .... cm .... m (1 mark)

$d_C =$ .... cm .... m (1 mark)

(f) Measure and record the thickness X of the half metre rule.

X = ... cm .... m (1 mark)

(g)   Place the pipe marked A on the bench and use the plasticine to stop it from rolling.
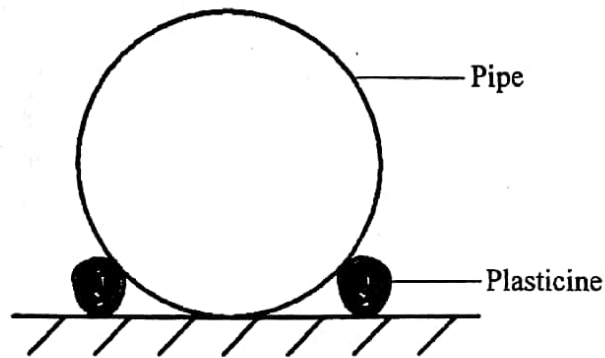(see **Figure 3 (a)**).

Figure 3 (a)

(h)   Place the half metre rule onto the pipe such that it balances horizontally. Ensure that the half metre rule is perpendicular to the axis of the pipe.
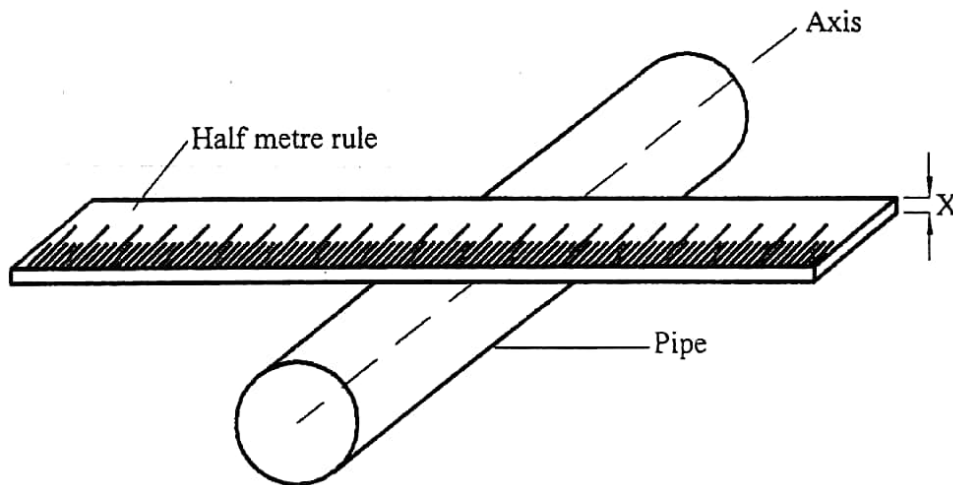(see **Figure 3 (b)**).

Figure 3 (b)

(i) Push one end of the balanced half metre rule slightly downwards and release it so that it oscillates up and down. Measure and record in **Table 3** the time for five complete oscillations.

(j) Repeat the procedure in (g), (h) and (i) for the other pipes B and C. Complete **Table 3.**

(5 marks)

Table 3

	Pipe A	Pipe B	Pipe C
Diameter d (m)			
Time for five oscillations			
Periodic time T (s)			
$Z = T \sqrt{\dfrac{3(d-x)}{2}}$			

(k) Determine the average value of Z.

(2 marks)

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