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 ....

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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)	Total
Maximum Score	1	1	6	5	3	1	2	1	
Candidate's Score									

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

Grand Total

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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**.

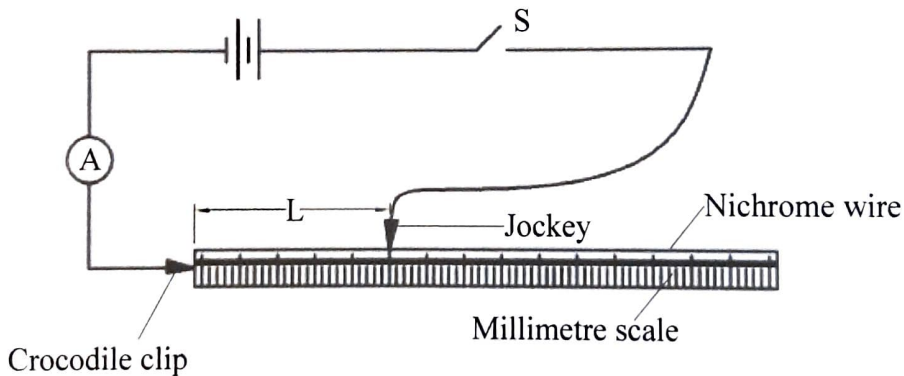**Figure 1**

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

E = ... volts.   (1 mark)

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(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)							
$\dfrac{1}{I}\,A^{-1}$							

(f)   On the grid provided; plot the graph of $\dfrac{1}{I}$ (y axis) against L.   (5 marks)

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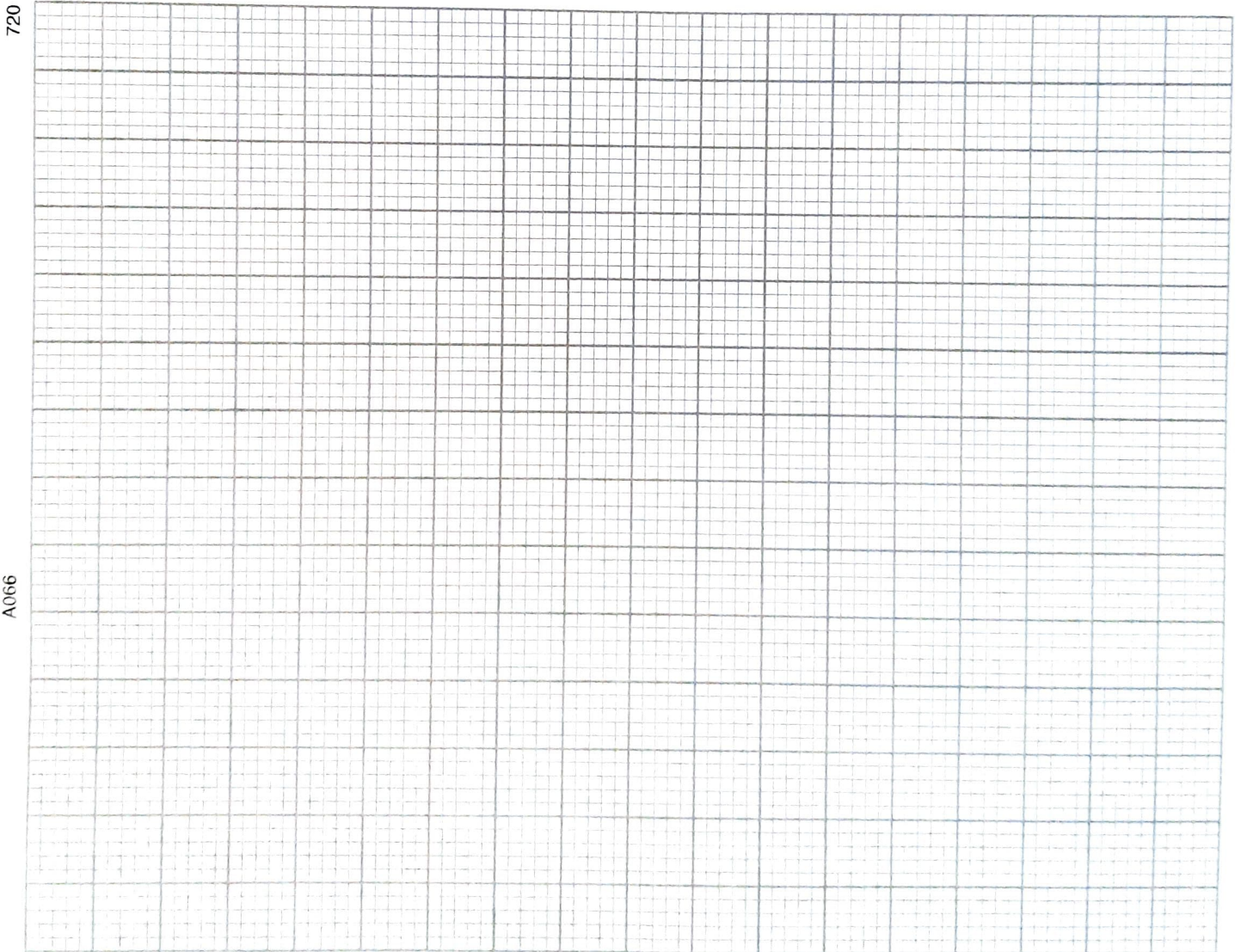
(g) From the graph, determine the:

    (i)   gradient S;   (3 marks)

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    (ii)   intercept C on the $\dfrac{1}{I}$ 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**.
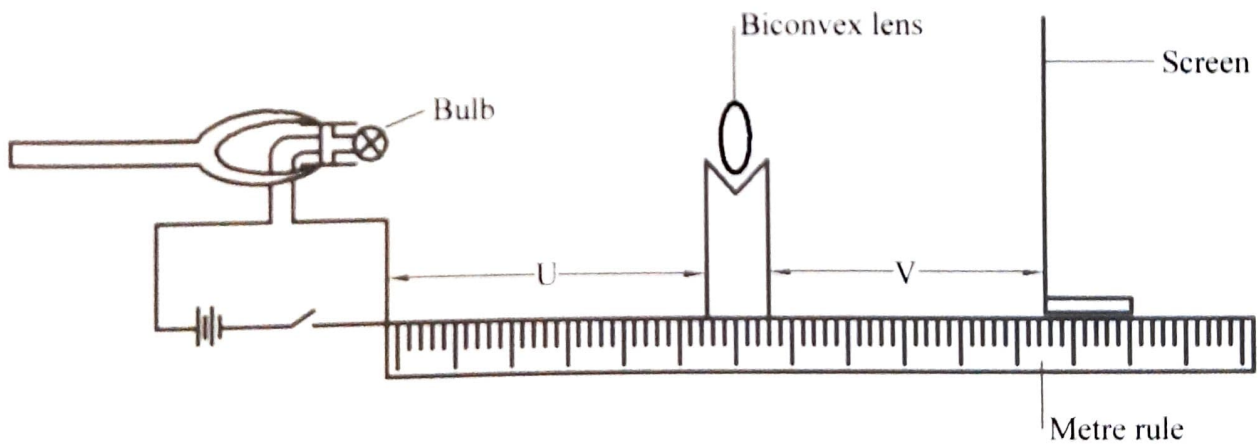

Figure 2

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(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)**).
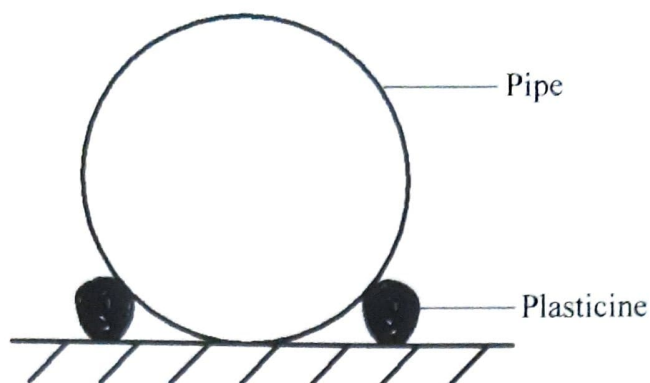

Figure 3 (a)

(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)**).
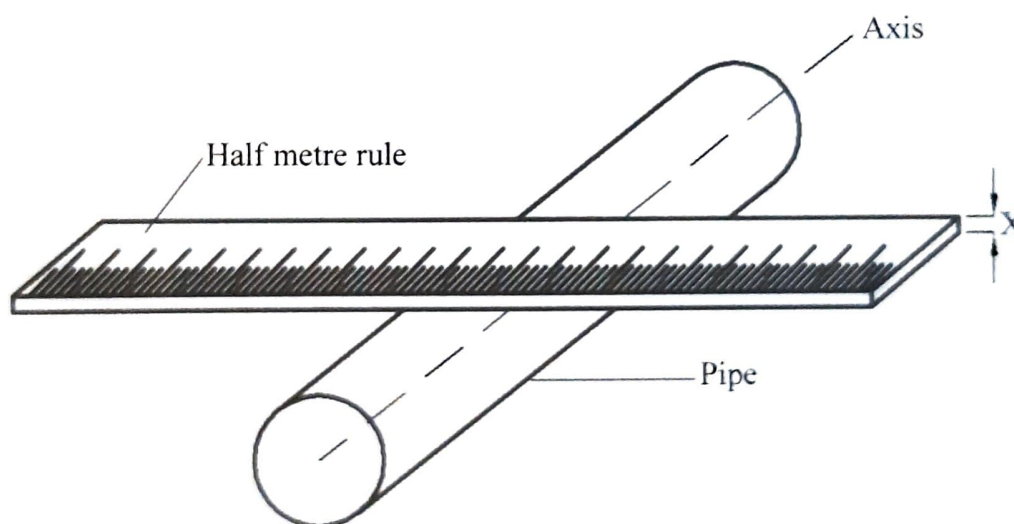

Figure 3 (b)

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(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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