3.6.3 Physics Paper 3 (232/3)

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.**

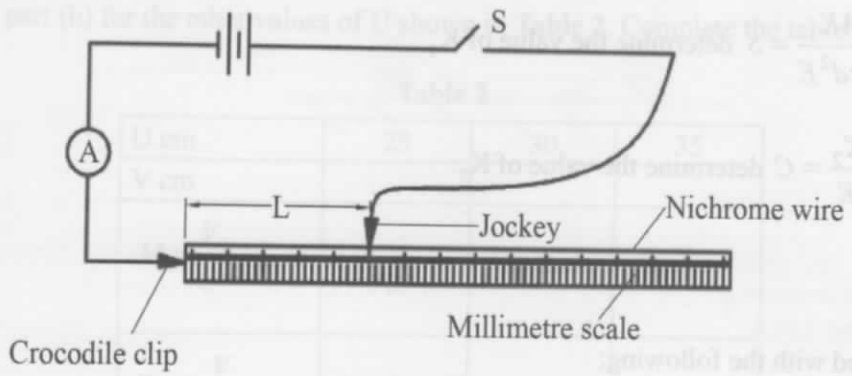

Figure 1

(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)

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

(h) Given that:

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

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

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**.

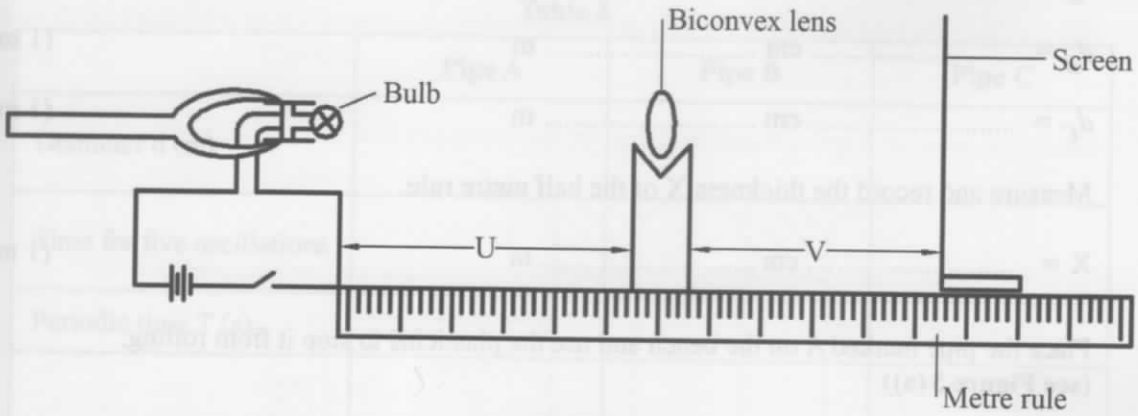

Figure 2

(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			
$M = \frac{V}{U}$			
$F = \frac{V}{M+1}$			

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

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))**.

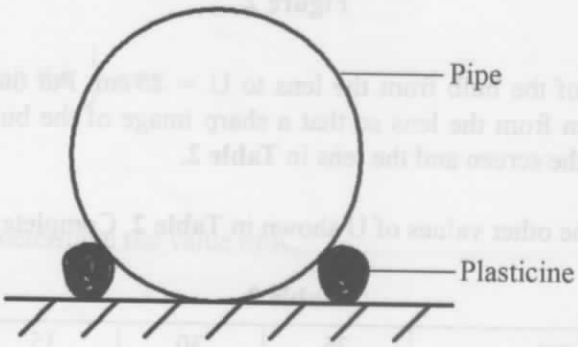

Figure 3 (a)

(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))**.

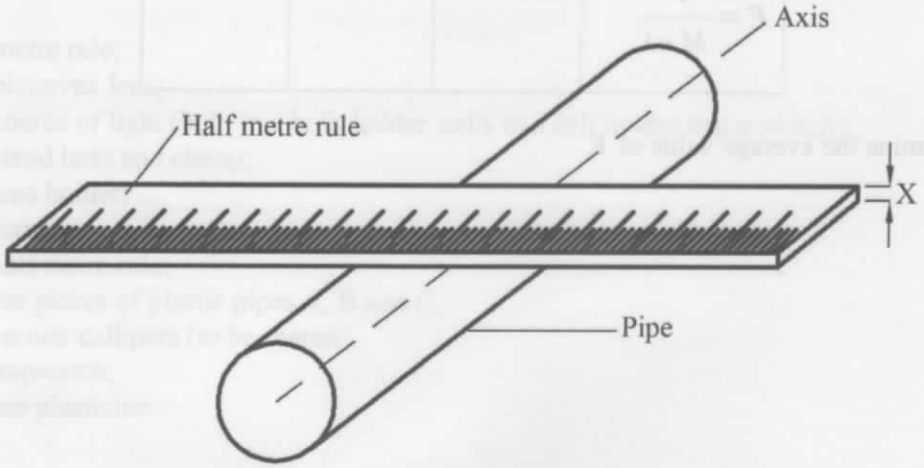

Figure 3 (b)

(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)			
$\not{Z} = T\sqrt{\frac{3(d-x)}{2}}$			

(k) Determine the average value of $\not{Z}$. (2 marks)