

KCSE TRIAL 2021
PHYSICS PAPER 3

QUESTION 1

You are provided with the following apparatus

- A Metre rule
- A wire of length at least 100cm
- A retort stand, boss and clamp.
- A stop watch or stop clock
- A micrometer screw gauge
- An overflow can
- A beaker at least 50ml or more.
- A 50ml measuring cylinder
- A piece of thread about 30cm
- Water in a 250ml beaker
- Two pieces of wood.
- Mass labelled m .

You are required to follow the following procedure

- (a) (i) Fill the overflow can with water to overflowing and then allow it to drain.
- (ii) Immerse the mass m into the can. Collect the overflow in a beaker as shown below in the figure below.

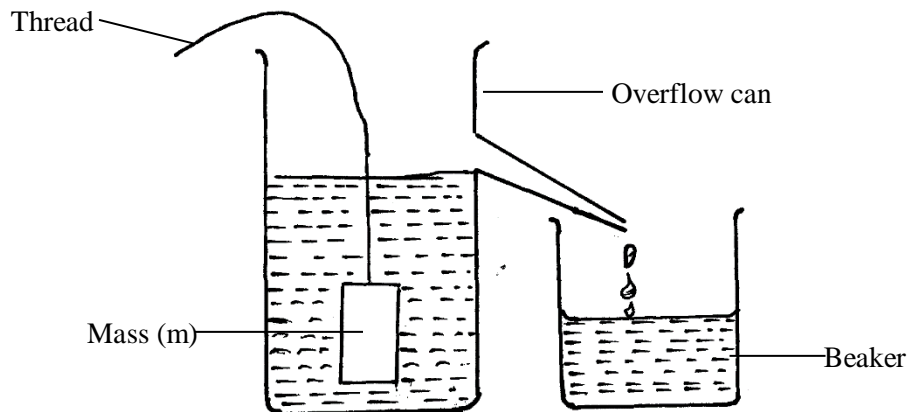


Fig. 1

- (iii) Using the measuring cylinder provided determine the volume V of the water collected in the beaker.

$$V = \underline{\hspace{4cm}} \text{ cm}^3 \quad (1 \text{ mark})$$

- (iv) Calculate I given that $I = \frac{10^6 m}{V}$ (Where $m=0.30 \text{ kg}$) (2 marks)

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- (b) Set up the apparatus as shown in figure 2 below. Ensure that the wire is free of kinks and the end tied to the hook is firm and the hook does not move.

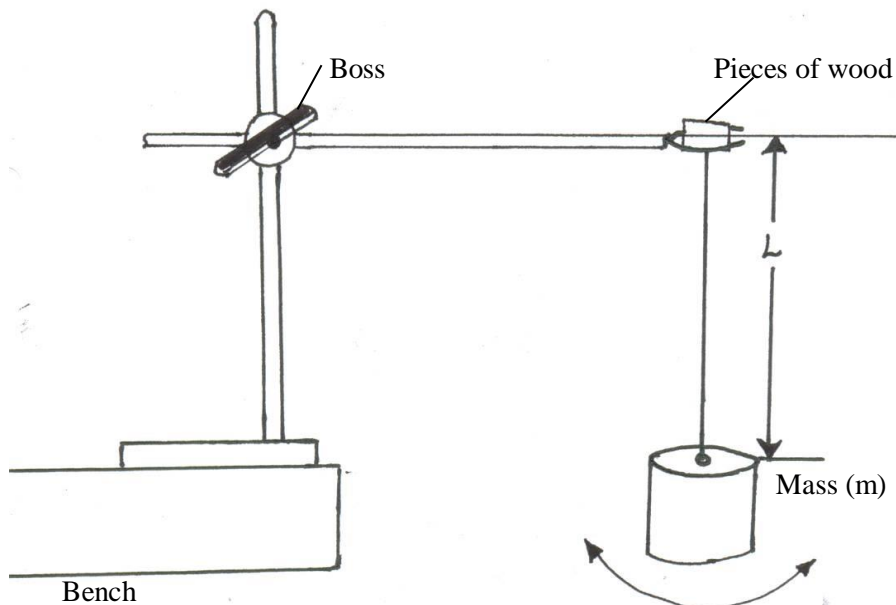


Fig 2.

- (c) Adjust the length L , of the wire so that $L = 70\text{cm}$, Give the mass m , a slight twist such that when released it oscillates about the vertical axis as shown by the arrows in figure 2. Measure the time for twenty oscillations and record in **Table 1**.

(d) Repeat the procedure in (c) above for other values of L, as shown in **Table 1**.

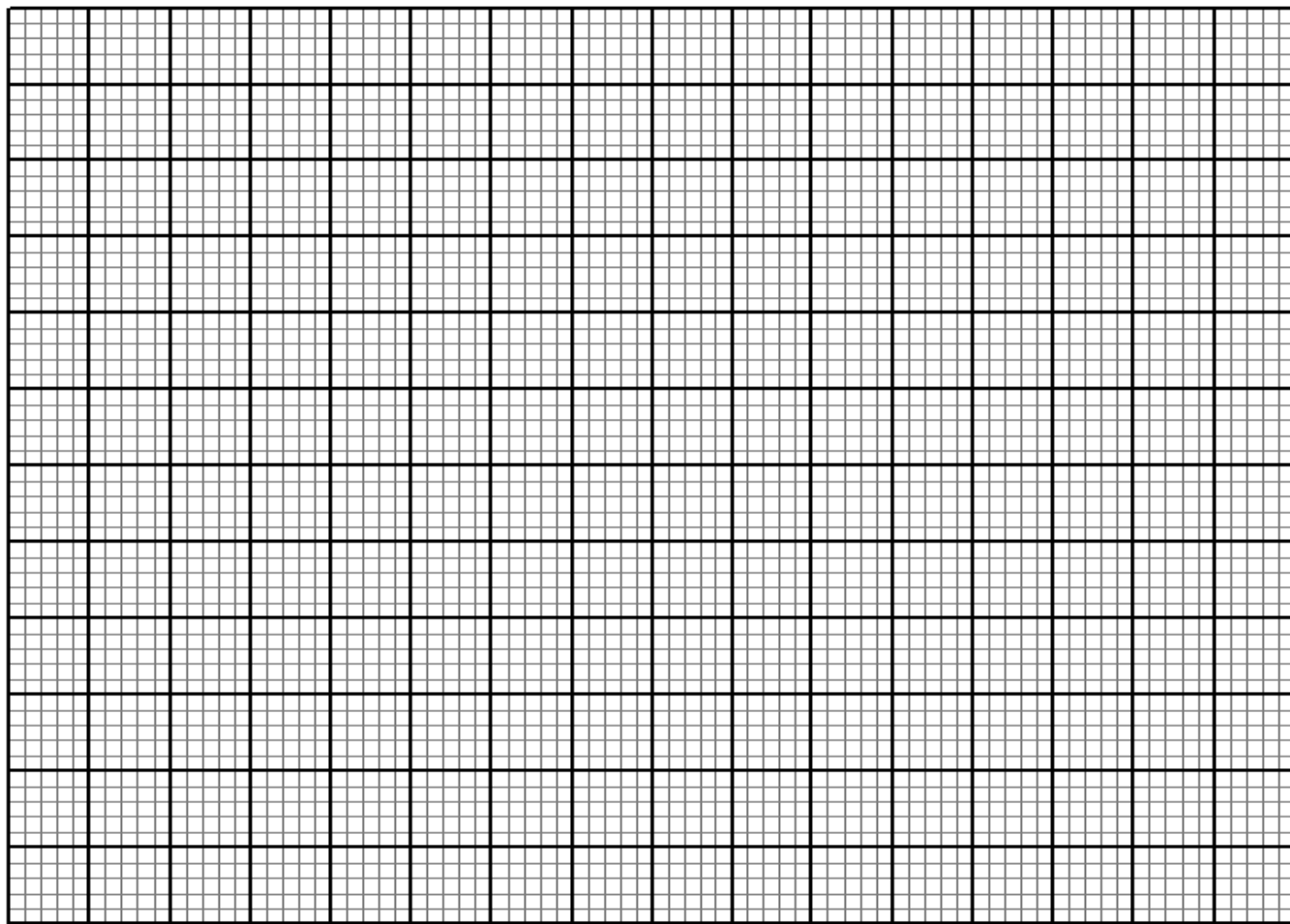
Complete the table.

(6 marks)

Length L (cm)	70	60	50	40	30	20
Length L (m)						
Time for 20 oscillations(s)						
Period T(s)						
T² (S²)						

Table 1

(e) On the grid provided, plot the graph of T² (S²) (y – axis) against L (m) (5 marks)



(f) Measure the diameter d of the wire. (1 mark)

$d = \dots\dots\dots$ metres

(g) (i) Determine the slope of the graph. (2 marks)

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(ii) Given that $T^2 = \frac{32\pi^2 L}{Gd}$ where G is a constant, use the graph to determine the value of G . (3 marks)

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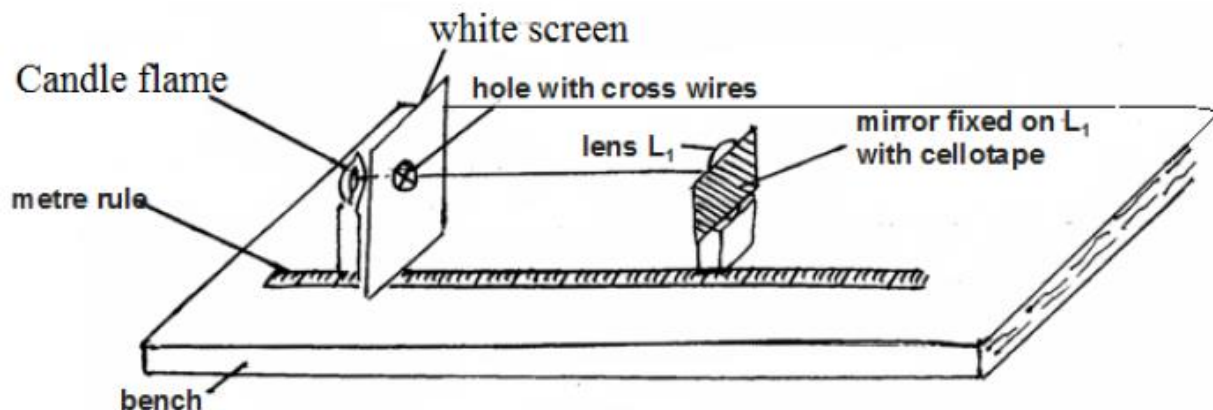
QUESTION 2

You are provided with the following apparatus

- A metre rule
- A screen fitted with cross-wires labelled O
- A mounted white screen labelled S
- A lump of plasticine
- A candle
- A plane mirror
- Two lenses mounted on holder labelled L1 and L2 - pieces of cello tape.

Proceed as follows:

- a) Arrange the apparatus as shown in the figure below so that the candle flame, the cross-wires and the centre of the lens lie on a straight line.



- b) Adjust the position of the lens arrangement (lens, mirror and holder) until a sharp image of the cross-wires is observed on the screen O.

Note: It might be necessary to adjust the position of the candle to make the image clearer.

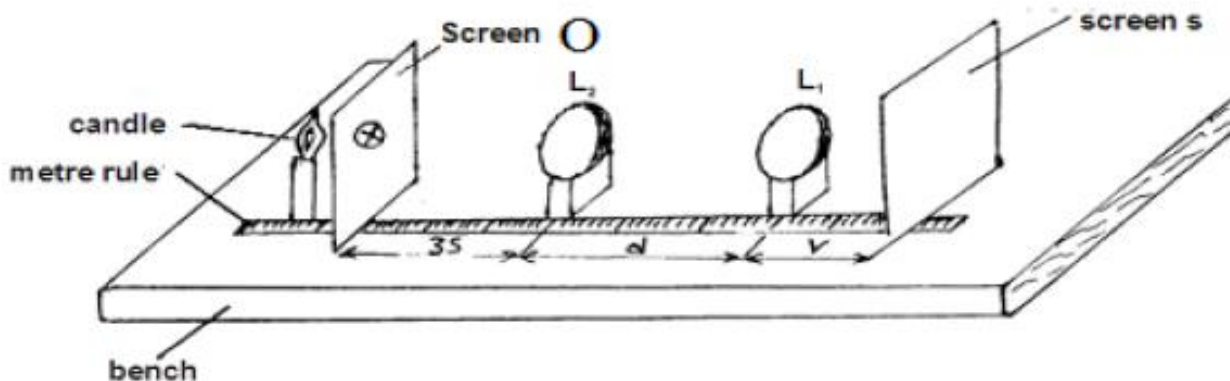
Measure the distance L_1 between the screen and the centre of the lens L_1

$L_1 = \dots\dots\dots$ (1 mark)

- c) Remove L_1 and replace it with L_2 . Repeat procedure in (b) above to obtain distance, L_2 between the screen and the centre of lens L_2

$L_2 = \dots\dots\dots$ (1 mark)

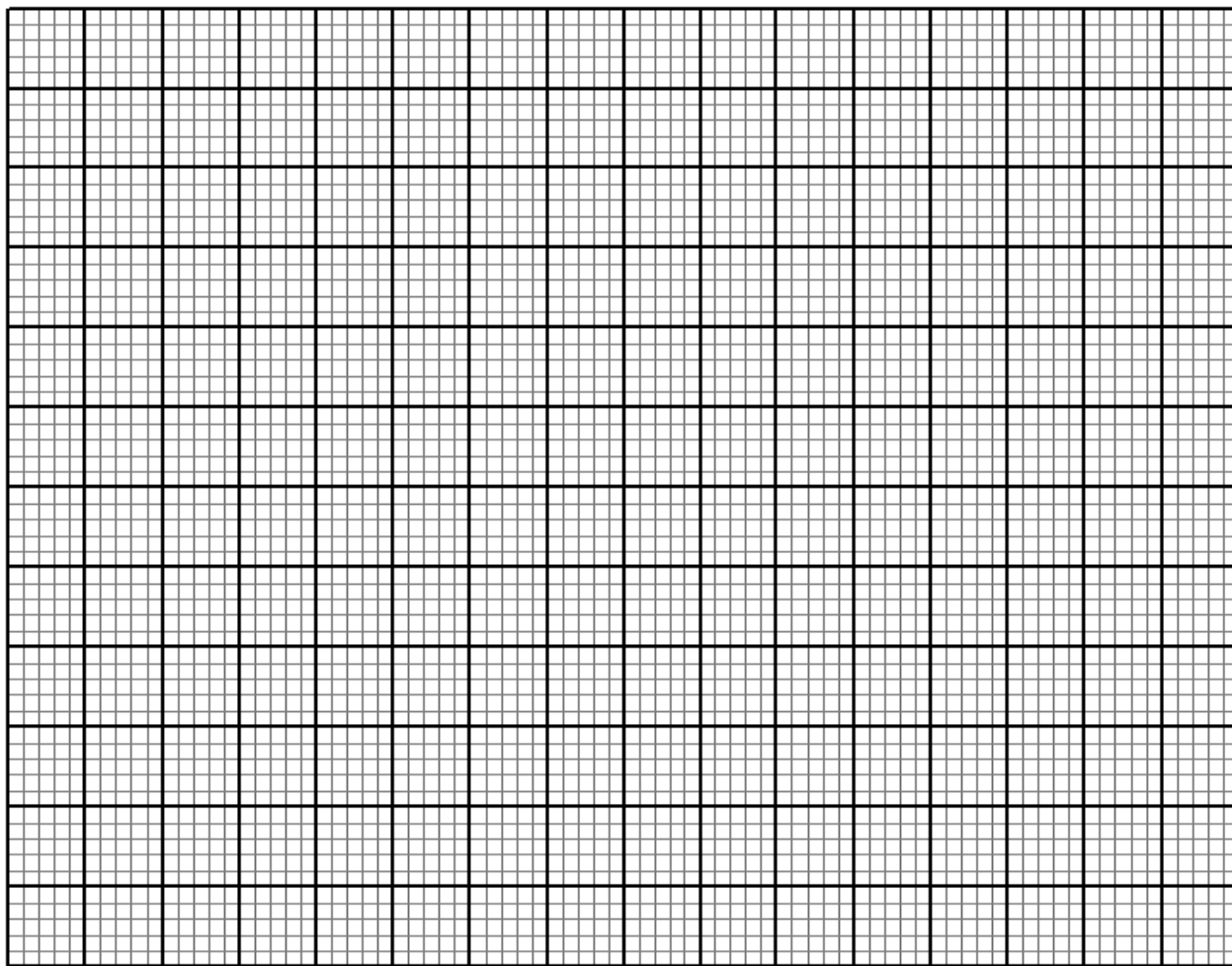
- d) Now remove the mirror and arrange the apparatus as shown in figure below so that the two lenses, the cross-wires and candle flame lie on the straight line.
 e) Adjust the position of lens L_1 so that the distance, d , is 5cm. (See figure below). Adjust the position of the screen S until a sharp image of the cross-wires is observed on the screen



- f) Repeat the procedure in (f) above for values of d , equal to 8cm, 12cm, 16cm and 20cm.

Distance d (cm)	5	8	12	16	20
Distance v (cm)					

- g) On the grid provided below, plot a graph of V (y-axis) against d . (5 marks)



h) Determine the intercept V_0 on the V -axis.

$V_0 = \dots\dots\dots$ (1 mark)

i) Calculate constant F of the lenses using two methods.

i)

$$F_1 = \frac{35v_0}{35+v_0} \quad (2 \text{ marks})$$

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ii)

$$F_2 = \frac{L_1 L_2}{L_1 + L_2} \quad (2 \text{ marks})$$

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j) Calculate the power of lens L_2 and state its SI unit. (3 marks)

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