Question 1 **[10 Marks]**

You are provided with 100 cm long wire mounted on a wooden board fitted with scale, two resistance boxes (1-10) Ω, two ammeters (0 – 1)A, dry cell, two one-way plug keys, connecting wires, d.c. source, jockey and galvanometer.

Using the materials provided, perform the experiment and determine the voltage drop across a dry cell by using its internal resistance.

You are expected to provide the information on the following components of your experiment in your answer:

- ***Aim of the experiment***
- ***Hypothesis***
- ***Theory (only working formula and diagram of the set-up)***
- ***Principle***
- ***Procedure***
- ***Observation*** **[Show your first set of reading to Visiting Examiner]**
- ***Result***
- ***Conclusion***
- ***Verification of hypothesis***

(Include necessary calculations and graphs if required)

Question 2

Find the relation between resonant length and tension. **[10 Marks]**

[*You are provided with the required materials and the procedure to carry out this experiment. Follow the procedure correctly, perform the experiment and present the findings in your answer script. (Note: DO NOT copy theory, principle, the materials required and procedure of the experiment in your answer script.)*]

Theory: The frequency of vibrations of a stretched wire is given by

$$f = \frac{1}{2l}\sqrt{\frac{T}{m}},$$

Where l = length of the wire,
T= tension and
m = mass per unit length of the wire.

Principle: It is based on the principle of resonance of sound.

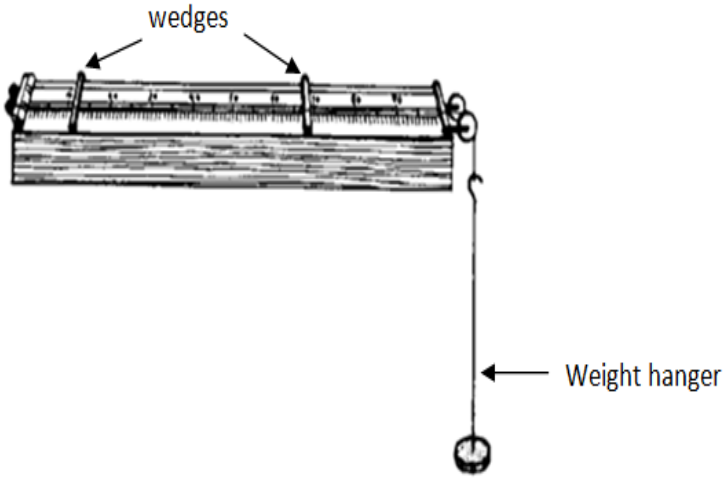


Figure 2: Sonometer

Apparatus:

A Sonometer, string or wire, hanger, half kilogram weights, two wedges (or bridges), tuning fork, paper rider and a rubber hammer

Procedure:

Step 1. Write the hypothesis for your experiment.
Step 2. Place the Sonometer on the table and suspend the hanger.
Step 3. Put a load (M) of about 2 kg (including hanger) and see that the wire is straight and free from any kinks. Place two wedges beneath the wire.
Step 4. Place paper rider on the middle of the wire, in between the two wedges.
Step 5. Note the frequency of the tuning fork.

Step 6. Strike tuning fork gently on the rubber hammer and put its stem gently on the wooden board while the tuning fork is vibrating.

Step 7. Adjust the position of the wedges till the length of the wire in between them starts vibrating in resonance with the tuning fork. In this position, the rider will be thrown off.

Step 8. Now measure the resonant length (l_1) of the wire between the wedges on the scale and note the reading.

Step 9. Increase the distance between the wedges by few cm. Again adjust the length of the wire for resonance by slowly decreasing the distance between the wedges. Record the length of the wire between the wedges as l_2.

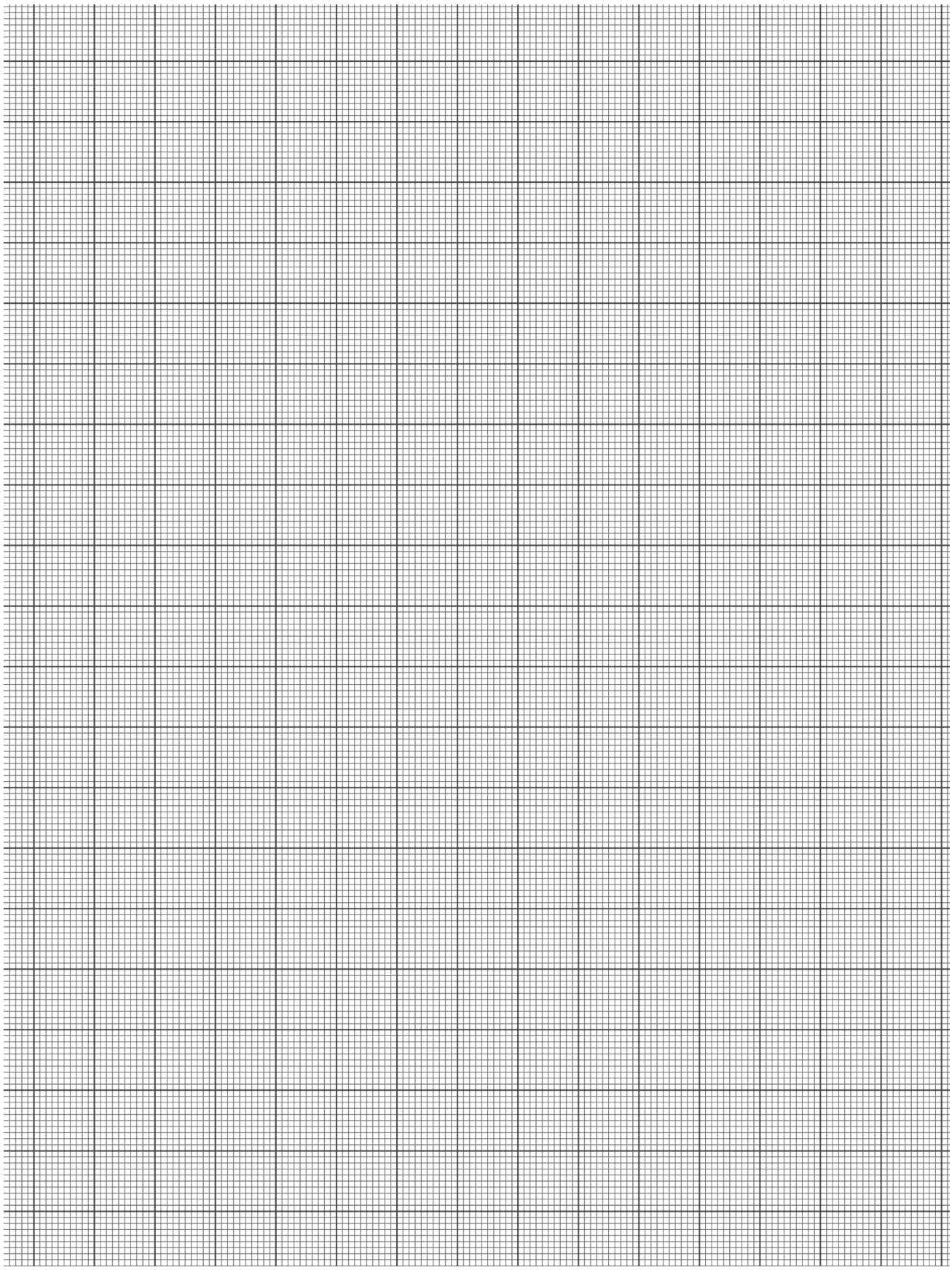
Step 10. Tabulate load (M), tension (T), length ($l_1, l_2,$ and mean l) and l^2 and name the table as Table 2: Resonant length and tension. ***[Show your first set of readings to Visiting Examiner]***

Step 11. Repeat Step 6 to Step 10 with the same tuning fork by increasing the load by 0.5 kg each time and find the corresponding resonant length between the bridges for four more sets.

Step 12. Plot a graph of l^2 versus T taking l^2 along y-axis and T along x-axis.

Step 13. Draw the conclusion from the graph.

Step 14. Verify your stated hypothesis.



For rough work

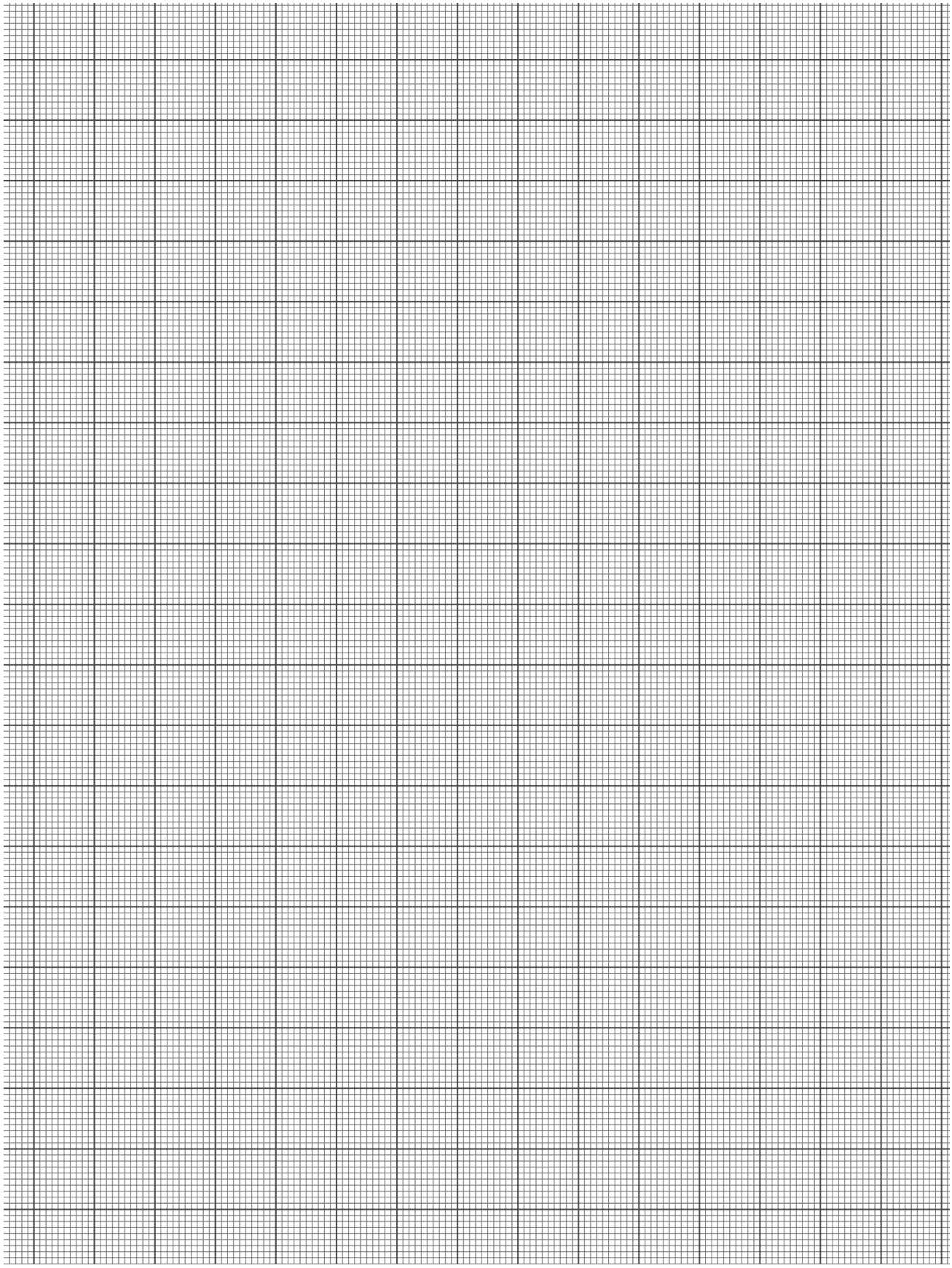
Question 1 **[10 Marks]**

You are provided with a Sonometer, a long wire of uniform thickness, 0.5 kg slotted weights, two wedges, paper rider, tuning fork, digital balance and rubber hammer. Determine the frequency of the tuning fork using the materials provided.

You are expected to provide the information on the following components of your experiment in your answer:

- ***Aim of the experiment***
- ***Hypothesis***
- ***Theory (only working formula)***
- ***Principle***
- ***Procedure***
- ***Observation*** **[Show your first set of readings to Visiting Examiner]**
- ***Result***
- ***Conclusion***
- ***Verification of hypothesis***

(Include necessary calculations if required)



Question 2 **[10 Marks]**

Determine the internal resistance of a dry cell by graphical method.

[*You are provided with the required materials and the procedure to carry out this experiment. Follow the procedure correctly, perform the experiment and present your findings in your answer script. (Note: DO NOT copy the materials required and procedure of the experiment in your answer script.)*]

Materials required:

Meter bridge, galvanometer, two one-way keys, d.c. source (0 - 4) V, dry cell, rheostat, ammeter, connecting wires, jockey and resistance box (0 – 10) Ω.

Procedure:

Step 1. Write hypothesis for your experiment.
Step 2. Note down the range and least count of meter bridge and ammeter.
Step 3. Arrange the apparatus on the table and make connections as shown in Figure 2.

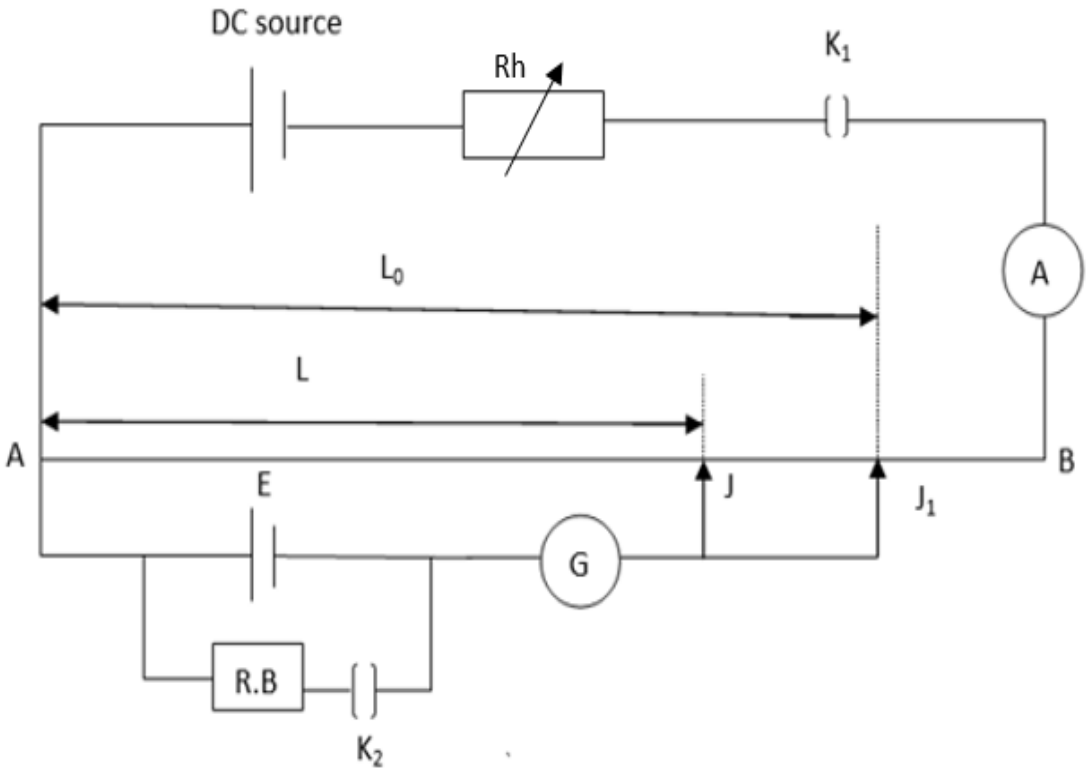


Figure 2

Step 4. Make all the keys of the resistance box and connections tight.

Step 5. Check the correctness of connections by first closing the key K_1 only and adjust resistance from the rheostat to get maximum reading in the ammeter. Then press jockey on extreme left end of the wire and note the direction of deflection. Next, press the jockey on extreme right end of the wire and again note the direction of deflection. If the deflections in the galvanometer are in opposite directions, the connections are correct. But if you get one side deflection only, then there may be loose connection. Rectify the error and proceed further.

Step 6. Close the key K_1, keeping the key K_2 open, and slide the jockey along the length of wire till deflection in galvanometer is zero. Note down the value of L_o.

Step 7. Introduce 1Ω resistance in the resistance box and close the key K_1 and K_2. Slide the jockey along the length of wire till deflection in galvanometer is zero. Record the resistance 'R' and length 'L'. Then calculate $X = \frac{1}{R}$ and $Y = \frac{L_0}{L}$ up to three significant figures. Tabulate the values of L, R, X and Y with correct units and name the table as Table 2: Internal resistance of a dry cell.

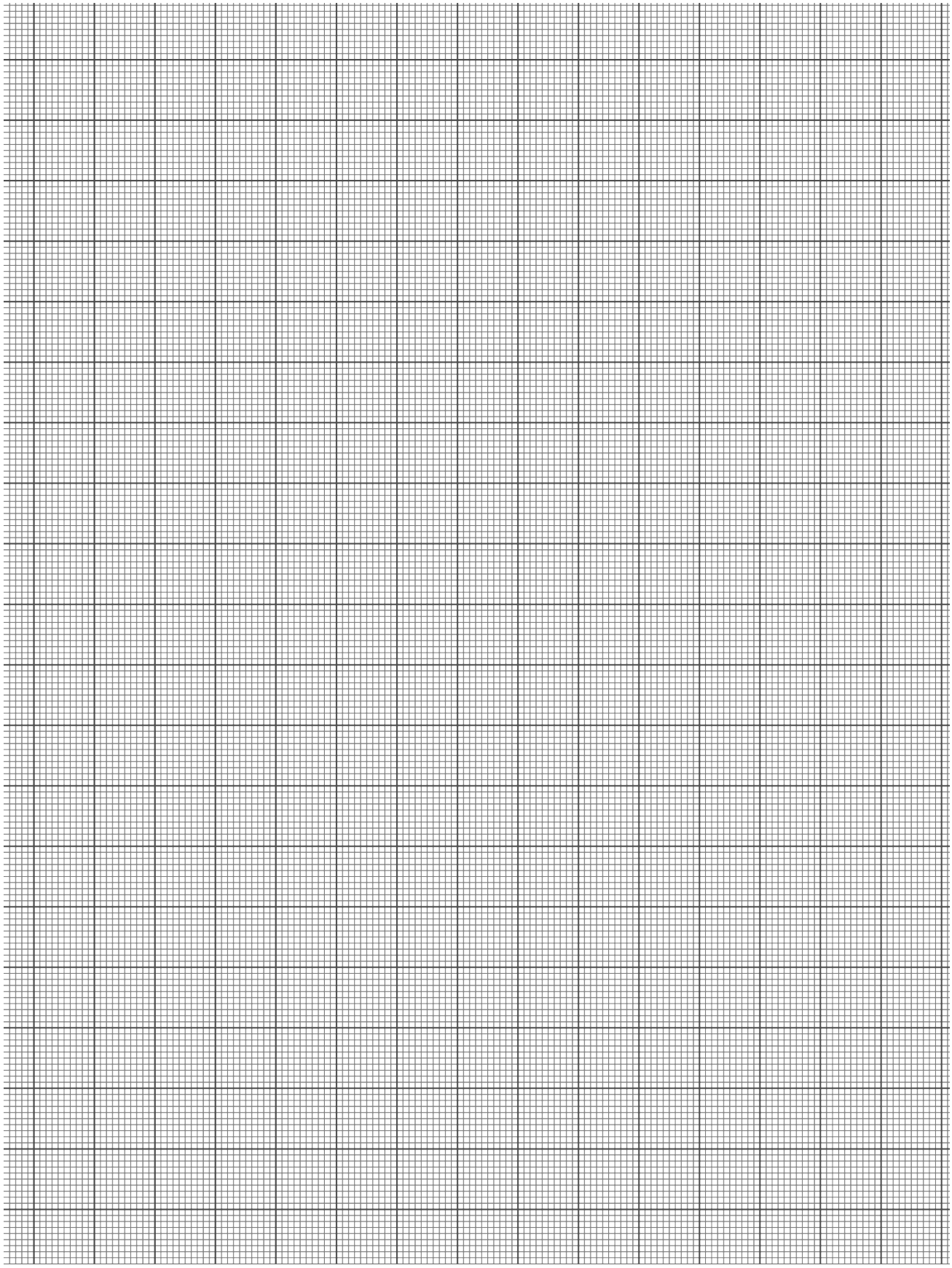
[Show the first set of reading to Visiting Examiner]

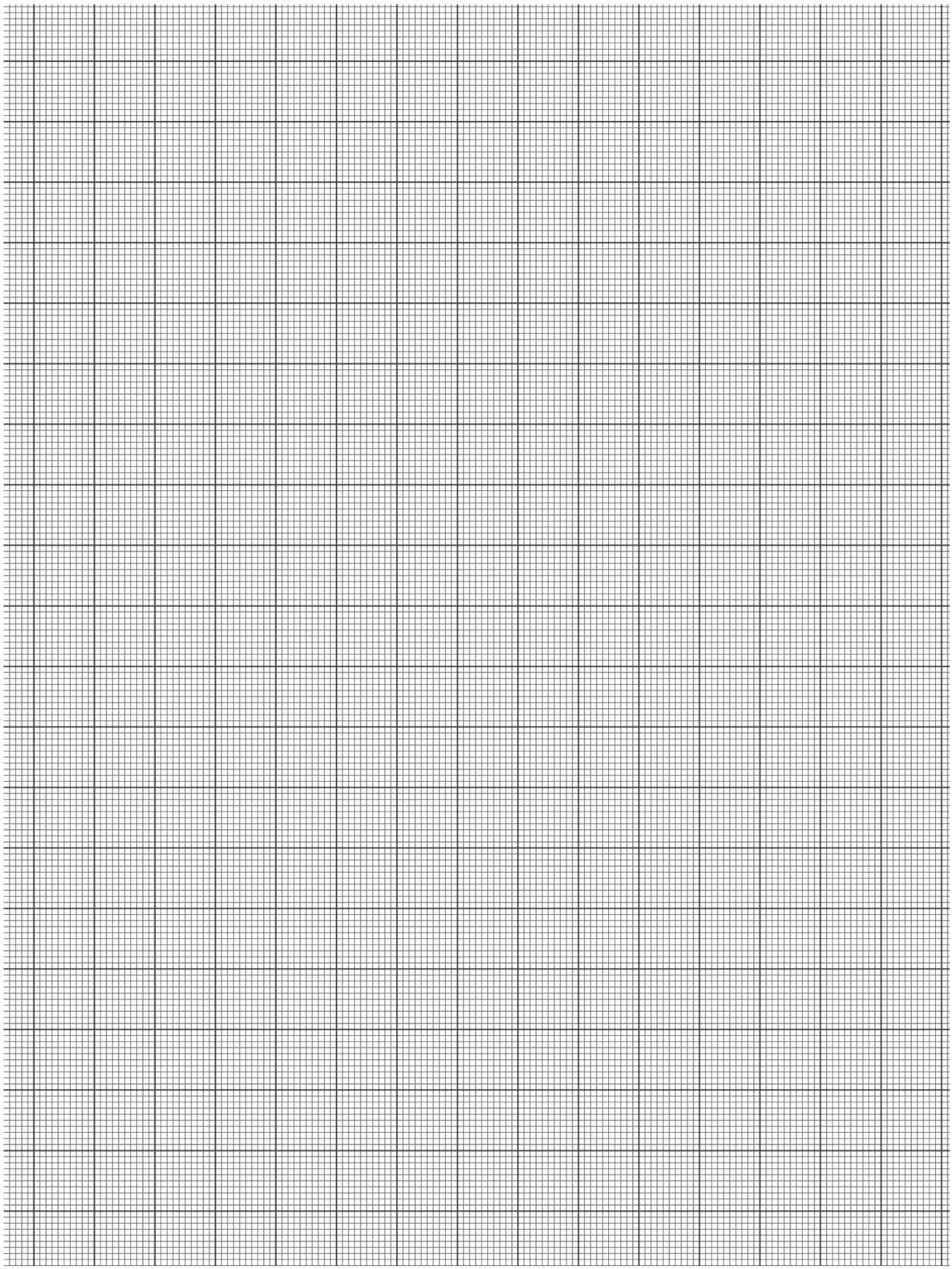
Step 8. Repeat the Step 7 to obtain four more sets of L by changing the value of R. Plot a graph for Y against X.

Step 9. Calculate the slope $S = \frac{\Delta Y}{\Delta X}$ of the graph up to three significant figures with proper unit.

Step 10. Write the result of your experiment and deduce the conclusion.

Step 11. Verify your stated hypothesis.





Rough work

Rough work

Question 1 **[10 Marks]**

You are provided with 100 cm long wire mounted on a wooden board fitted with scale, resistance box (1-10) Ω, resistor of unknown resistance, screw gauge, one-way plug key, connecting wires, d.c. source, jockey, meter scale and galvanometer.

Determine specific resistance of the material of the wire using the given materials.

You are expected to provide the information on the following components of your experiment in your answer:

- ***Aim of the experiment***
- ***Hypothesis***
- ***Theory (only working formula and diagram of the set-up)***
- ***Principle***
- ***Procedure***
- ***Observation*** **[Show your first set of reading to the Visiting Examiner]**
- ***Result***
- ***Conclusion***
- ***Verification of hypothesis***

(Include necessary calculations and graphs if required)

Question 2

Find the relation between frequency and tension. **[10 marks]**

[*You are provided with the required materials and the procedure to carry out this experiment. Follow the procedure correctly, perform the experiment and present your findings in your answer script. (Note: DO NOT copy the theory, principle, materials required and procedure of the experiment in your answer script.)*]

Theory: The frequency of vibrations of a stretched wire is given by

$$f = \frac{1}{2l}\sqrt{\frac{T}{m}},$$

Where l = length of the wire,
T= tension and
m = mass per unit length of the wire.

Principle: It is based on the principle of resonance of sound.

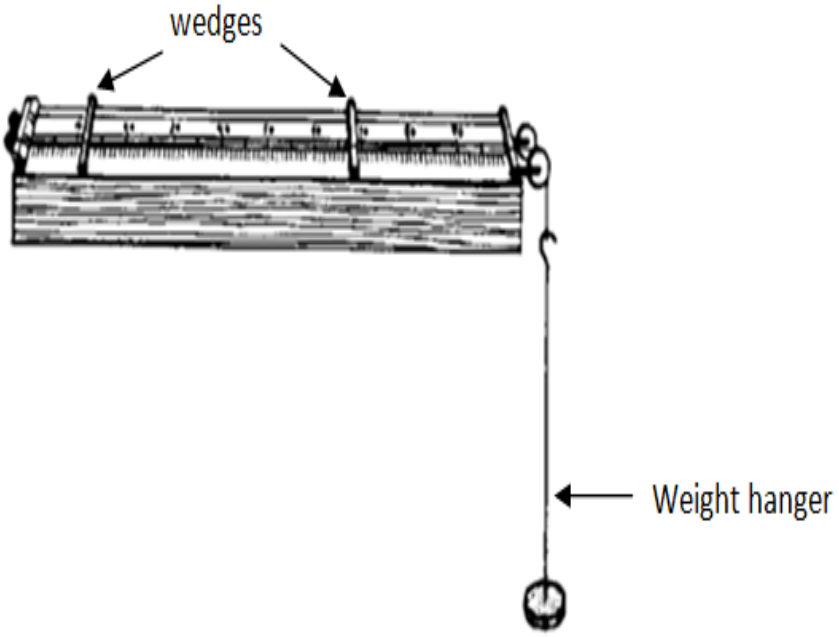


Figure 2: Sonometer

Apparatus:

A Sonometer, string or wire, hanger, half kilogram weights, two wedges (or bridges), a tuning fork and rubber hammer.

Procedure:

Step 1. Write the hypothesis for the experiment.

Step 2. Place the Sonometer on the table and suspend the hanger.

Step 3. Put a load of about 2 kg (including hanger) and see that the wire is straight and free from any kinks. Place two wedges beneath the wire.

Step 4. Place paper rider on the middle of the wire, in between the two wedges.

Step 5. Note the frequency of the tuning fork.

Step 6. Strike a tuning fork gently against a rubber pad and put its stem gently on the wooden board while the tuning fork is vibrating.

Step 7. Adjust the position of the wedges till the length of the wire in between them starts vibrating in resonance with the tuning fork. In this position, the rider will be thrown off.

Step 8. Now measure the resonant length (l_A) of the wire between the wedges on the scale.

Step 9. Increase the distance between the wedges by few cm. Again adjust the length of the wire for resonance by slowly decreasing the distance between the wedges. Record the length of the wire between the wedges as l_B. Mean of l_A and l_B gives the length l_1 of the wire which vibrates with frequency f_1 (equal to that of tuning fork)

Step 10. Tabulate load (M), tension (T), $\sqrt{T}$, length (l_A , l_B, and l_1), calculated frequency and $\frac{\sqrt{T}}{f}$ and name the table as Table 2: Tension and frequency. ***[Show your first set of readings to Visiting Examiner]***

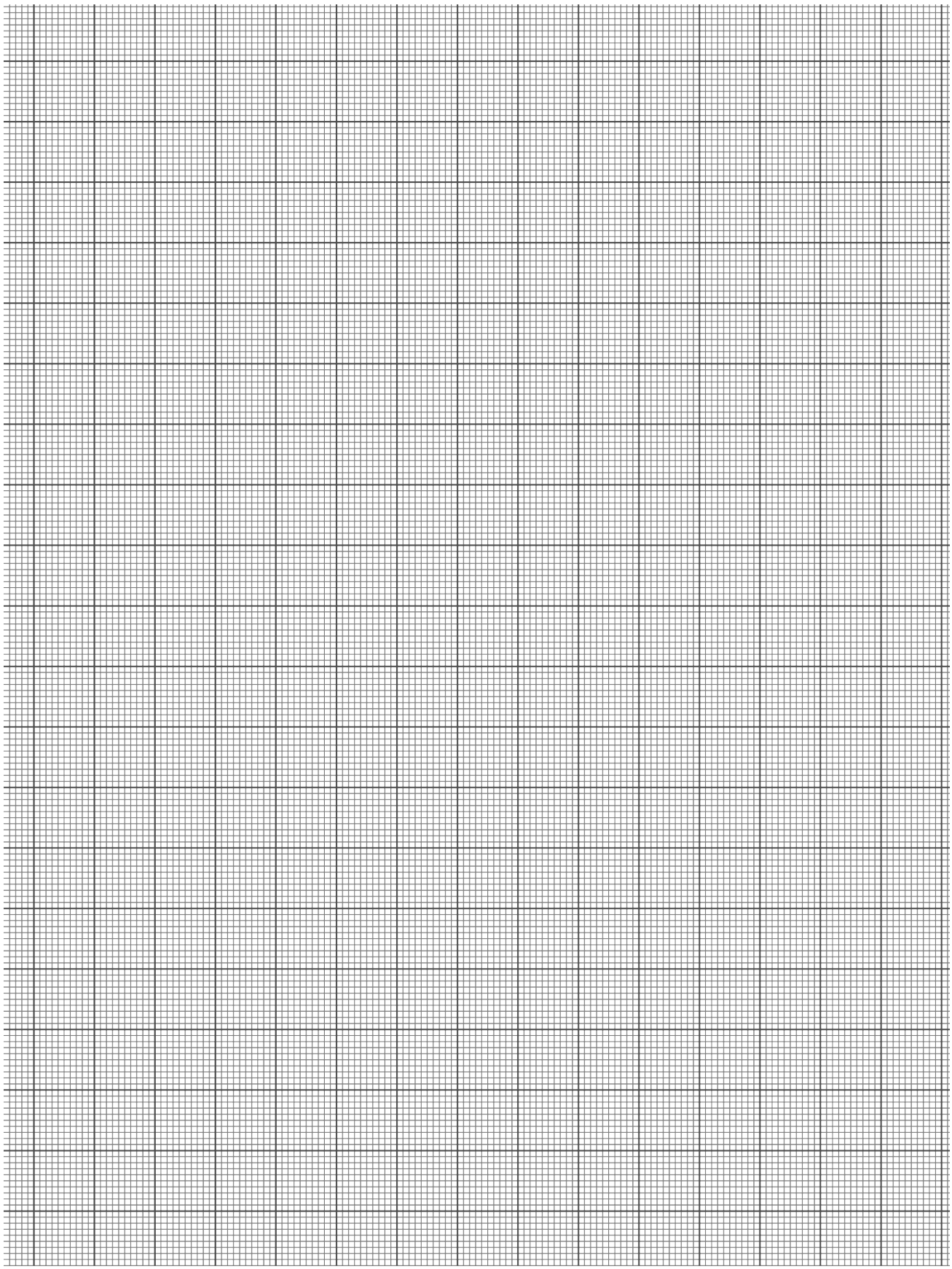
Step 11. Repeat Step 6 to Step 10 by increasing the load by 0.5 kg and find the new resonant length l_2 of the wire which vibrates with the same frequency f_1 while under different tension. Now calculate the frequency f_2 using the relation $f_2 = f_1 \frac{l_2}{l_1}$.

Step 12. Repeat Step 6 to Step 10 similar to Step 11 and calculate the corresponding frequency $f_3 = f_1 \frac{l_3}{l_1}$, $f_4 = f_1 \frac{l_4}{l_1}$ and $f_5 = f_1 \frac{l_5}{l_1}$ and complete the Table.

Step 13. Plot a graph between f (calculated) versus $\sqrt{T}$ taking $\sqrt{T}$ along y-axis and f along x-axis.

Step 14. Draw conclusion from the graph.

Step 15. Verify your stated hypothesis.



For rough work