Pre-Lab Report

Lab section:

Name & Surname:

Table #:

***Before the Lab** complete this page YOURSELF! Hand it in in the first 5 min. of the session PERSONALLY!*

You MUST justify your answers and show all steps. NO COPYCAT answers, or NO credits!

Please read the relevant presentation on PHYS LAB Website.

Q1. **In this experiment standing waves are going to be studied. Speed of the standing wave depends on the tension and the density (mass per unit length) of the string;** $v = \sqrt{\frac{T}{\mu}} = f\lambda$ **.**

Explain this equation, define the elements in it and comment on the relation between them. **Justify your answer or no credits!**

Q2. Give the definition of node. Discuss the relation between the node concept and the frequency of the wave on string. **Justify your answer or no credits!**

(3rd Question is on the next page!)

Q3. Show the dimensional **analysis** for μ. **Show your formulae / derivation below explicitly or no credits!**

1

Lab Report

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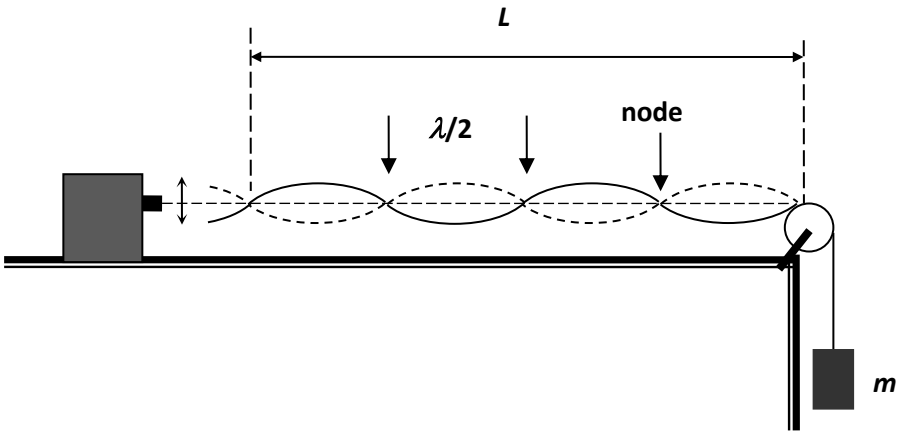
Complete this report YOURSELF except DATA taking parts! Use a pencil for plots only and a pen for the rest! **Show your work clearly, NO COPYCAT analysis allowed, or NO credits!**

OBJECTIVE : To study the standing waves in a cord, and to verify the equation for the velocity of a wave on a string.

THEORY :



When a string fixed on both ends and under tension is excited on one end, there will be waves traveling along the string. If we continue to excite the string, the waves reflected from the other end will interfere with the waves traveling in the forward direction. If the length of the string is exactly equal to the integer multiples of the half wavelengths, there will be standing waves along the string. The points where the string is motionless are called *nodes* and the distance between successive nodes will be equal to the half wavelength. Speed and the wavelength of the waves traveling along the string depend on the tension and the mass per unit length of the string:

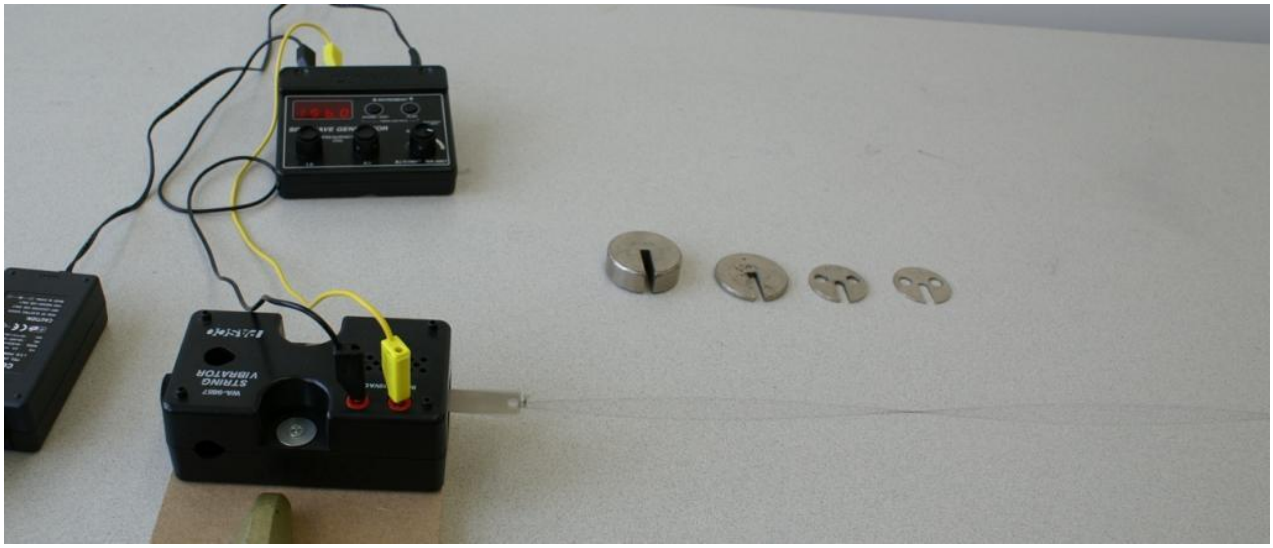
$$v = \left(\frac{T}{\mu}\right)^{\frac{1}{2}} = f\lambda$$

$$T = \mu\lambda^2 f^2$$

A Plot of the tension versus the square of the frequency data pairs that produce standing waves should follow a straight line whose slope is equal to the mass per unit length times the square of the wavelength. Tension on the string is provided by the masses placed on the hanger on the other end.

2

APPARATUS: String vibrator and its variable frequency power supply, hanger and mass set, string.



PROCEDURE :

1. Length of the cord between the vibration generator and the pulley is kept constant.
2. Place a mass on the mass holder and set the vibration generator in motion.
3. Arrange the frequency of the vibration generator until standing waves are clearly observed.
4. Determine the number of nodes and the wavelengths.
5. Record the frequency value along with the corresponding mass on the mass holder.
6. By keeping the **wavelength constant**, change the mass and read the corresponding frequency for clearly observed standing waves for 4 more times.
7. **Plot tension, *T*, versus f^2** and determine the slope.
8. Calculate the mass per unit length for the cord.

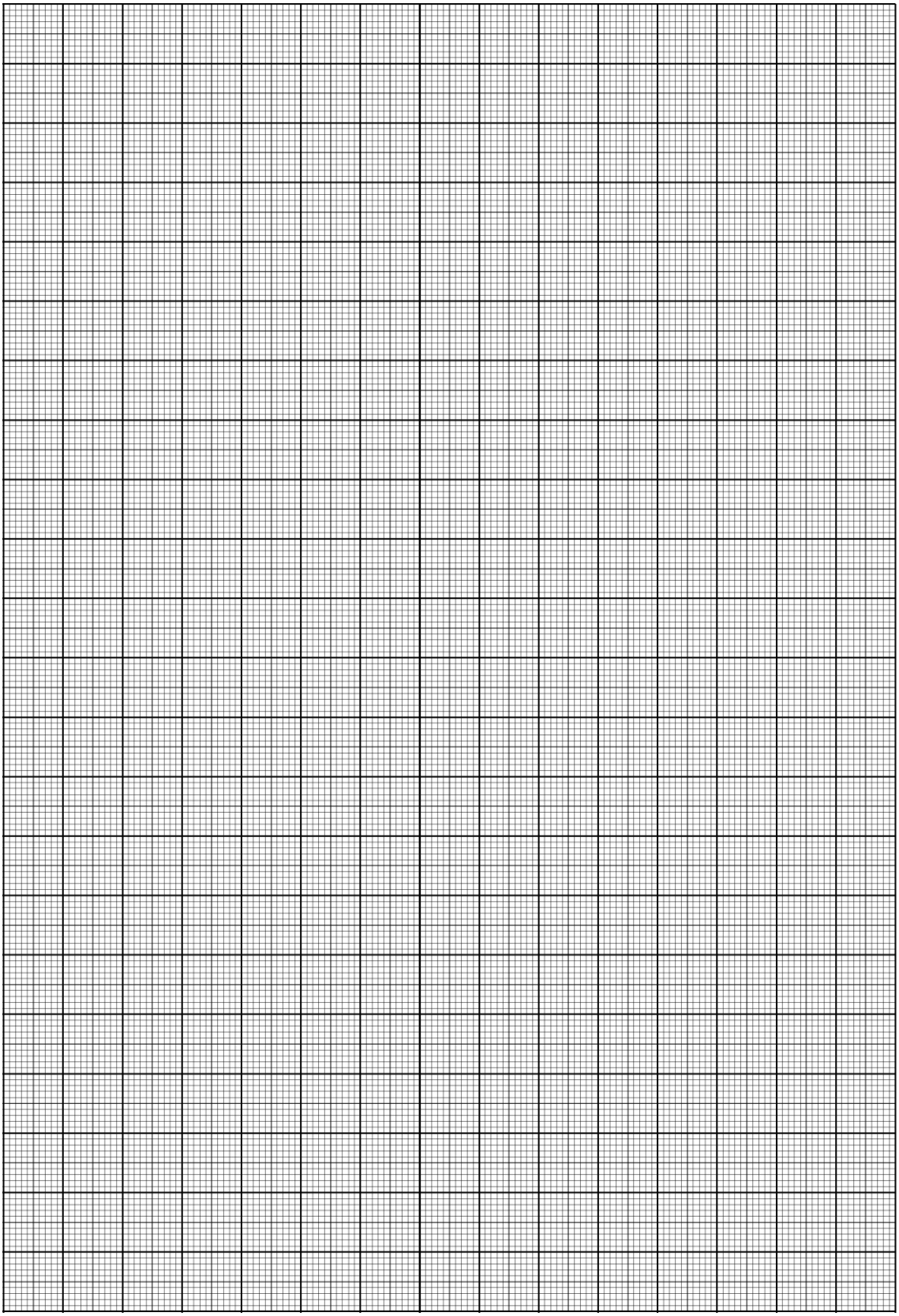
3

DATA:

Description / Symbol			Value & Unit
Mass per unit length of the Cord	μ_{TV}	=	.....
Length of the Cord	L	=	.....
Acceleration due to gravity	g	=	.....

Mass, m ( )	# of λ / 2 *(keep constant)*	λ ( ) *(keep constant)*	Frequency, f ( )	f^2 ( )	Tension $T = m.g$ ( )

4



5

CALCULATIONS & RESULTS:

A) **From the graph, choose two SLOPE POINTS other than data points,**

SP_1 : (;)

SP_2 : (;)

B) **Calculate:**

SLOPE = ...

Description / Symbol	Calculations (show each step)	Result
Mass per unit length of the Cord μ_{EV} =	. . . . .	. . . . .
	. . . . .	
% Error for μ =	. . . . .	. . . . .

Consult to the resources for this experiment from PHYS LAB Website:

PHYL102 Intro **Presentation #6** **PHYL102 Lab Book**