Pre-Lab Report

Lab section:

Name & Surname:

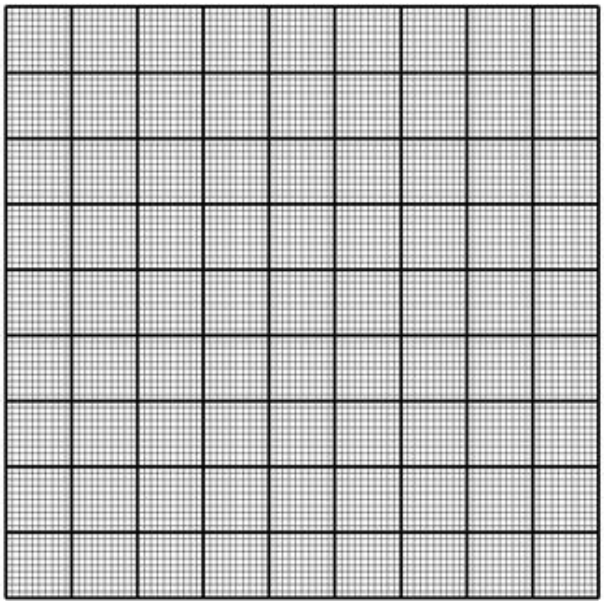
Table #:

***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. Plot a sine wave with 3 upper peaks on an oscilloscope screen given below. The length between the leftmost and the rightmost peak of a sinusoidal wave is measured to be L. Height between the maximum and minimum values of the same wave on vertical axis is measured to be 2A**.**



Show the formulation for the following:

a) Length of one wave (l) =

b) Period (T) =

c) Frequency (f) =

d) $V_{p\text{-}p}$ (Volt) =

e) V_{max} =

f) V_{rms} =

(Hint: You should express the result in terms of n: # of waves, [Time/div], [Volt/div], L and A)

(2nd Question is on the next page!)

Q2. Explain in your OWN WORDS and in ONE SENTENCE, the meanings of the following. **Do not write copycat answers or no credits!**

a) [Time/div]

b) [Volt/div]

Q3. Suppose that [Time/div] = 1.00 μs and [Volt/div] = 5.00 mV is given for the sine wave you have plotted in Question 1. Calculate the following. **Show your formulae / derivation below <u>explicitly or no credits</u>!**

a) Frequency of the sine wave.

b) V_{rms} of the sine wave.

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 learn how to operate a cathode ray oscilloscope and how to use it in studying alternating current (AC) circuits.

THEORY : Cathode Ray Tube Oscilloscope displays all types of waveforms with an electron beam hitting the fluorescent screen. Electron beam is deflected according to the voltage applied to its vertical and horizontal inputs through amplifying circuits. Usually the voltage applied to its horizontal input is a periodic signal generated internally so that the screen displays a dynamic picture of the waveform applied to the vertical input. The rate of this internal sweeping frequency is set by the time-base dial or the horizontal sweep rate. Usually the horizontal sweep is calibrated to set specific time interval per centimeter on the screen. Similarly the vertical scale is set by the voltage knobs as specific voltage values per centimeter.

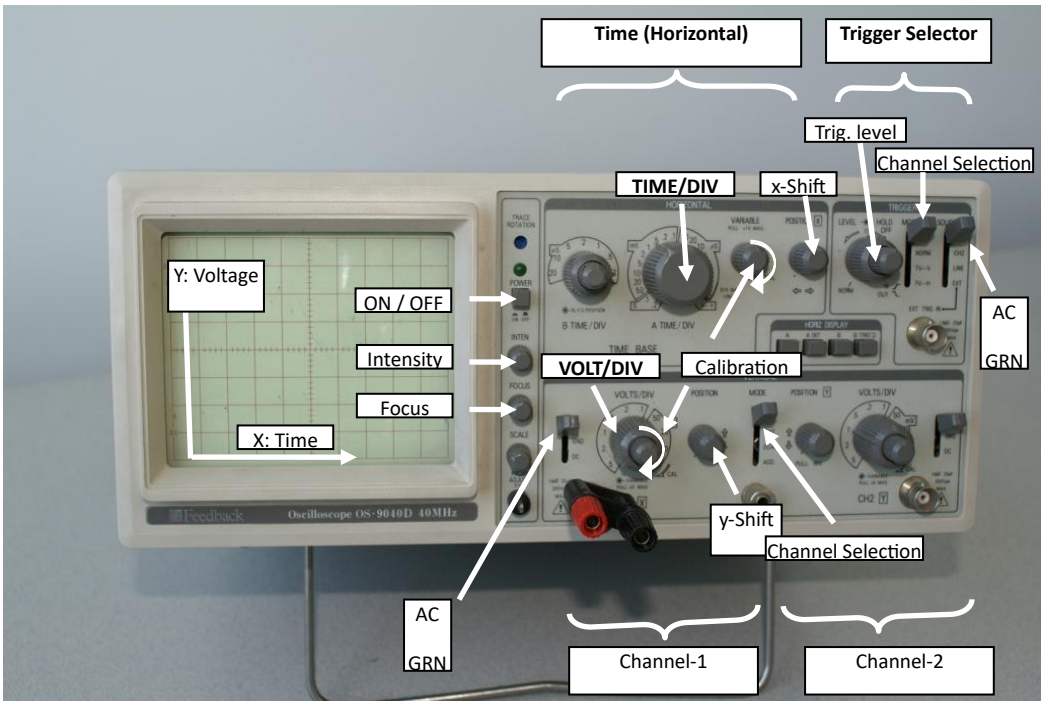
$$V_{rms} = \frac{V_{pp}/2}{\sqrt{2}} = \frac{V_{\max}}{\sqrt{2}}$$

Period or time intervals are also determined by measuring the horizontal length and multiplying this length by the horizontal sweep rate. Frequency of a periodic signal is also determined by inverting the period. Make sure that the calibration dials are turned all the way to the right (or in the direction of the arrow next to the dial) to ensure that the V/DIV and TIME/DIV settings are correct.

Displayed image on the screen can be moved up and down and left to right with corresponding dials. Starting position of the waveform display can be chosen by the adjustment of the trigger knob either automatically (auto) or manually (normal). There are also dials to adjust the intensity, focus, astigmatism, and panel lighting. Input type of the signal is selected through the three-position switch next to the vertical gain dial. AC means that the AC component of the signal is displayed. DC means the signal is displayed with its DC offset. GND means the input is grounded. This is selected if you want to make adjustments to the oscilloscope without the interference of the input signal. There are two identical sets of most of these dials in a two-channel oscilloscope that you will be using. You should refer to the oscilloscope manual for more specific dials.

2

APPARATUS : Two-channel oscilloscope and an oscillator i.e. Signal Wave Generator (SWG).



Cathode Ray Oscilloscope: In the experiment, we will use a digital version of it!

PROCEDURE :

1. Examine the front panel of the oscilloscope to become familiar with the various dials and controls.
2. Set the oscillator i.e. Signal Wave Generator (SWG) to produce a sine wave. To measure the frequency of the oscillator, set the TIME/DIV sweep dial to a number of values.
3. For each sweep dial value, measure the length of the wave on the screen and calculate the period. Then, determine the corresponding frequency.
4. Compare the calculated frequency with the oscillator frequency.

3

DATA-TAKING: PART-1

Set SWG to 500 Hz.	f_{TV}*=

*Read the applied frequency fTV from oscilloscope screen.

** Do not change the amplitude of the applied wave and the Volt/Div dial setting for both readings

	TIME MESAUREMENTS**	
1st Reading	[TIME / DIV]$_1$	
	L_1	
	# of waves$_1$ in L_1	
	Length of the wave, λ_1	
	Period, T_1	
	Frequency, f_{EV-1}	

2nd Reading	[TIME / DIV]$_2$	
	L_2	
	# of waves$_2$ in L_2	
	Length of the wave, λ_2	
	Period, T_2	
	Frequency, f_{EV-2}	
	$f_{EV} = (f_{EV-1} + f_{EV-2})/2$	

Error for *f*:

SWG set to 500 Hz	
VOLTAGE MEASUREMENT	
[VOLT / DIV]	
V_{pp} (div)	
V_{pp} (Volt)	
$V_{max} = V_{pp} / 2$	
$V_{rms} = V_{max} / \sqrt{2}$	

DATA-TAKING: PART-2

***Set SWG to* 20 kHz.**	f_{TV}*=

***Read the applied frequency fTV from oscilloscope screen.**

TIME MESAUREMENTS	
[TIME / DIV]	
L	
# of waves in *L*	
Length of the wave, λ	
Period, *T*	
Frequency, f_{EV}	

% Error for *f*:

5

DATA-TAKING: UNKNOWN FREQUENCY

$V_{measured}$*= V_{TV}	

*Measure V_{rms} using a multimeter

TIME MESAUREMENTS	
[TIME / DIV]	
L	
# of waves in *L*	
Length of the wave, λ	
Period, *T*	
Frequency, f_{EV}	

VOLTAGE MEASUREMENT	
[VOLT / DIV]	
V_{pp} (div)	
V_{pp} (Volt)	
$V_{max} = V_{pp} / 2$	
$V_{rms} = V_{max} / \sqrt{2}$	

% Error for V_{rms} :

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

PHYL201 Intro

Presentation #4

PHYL201 Lab Book