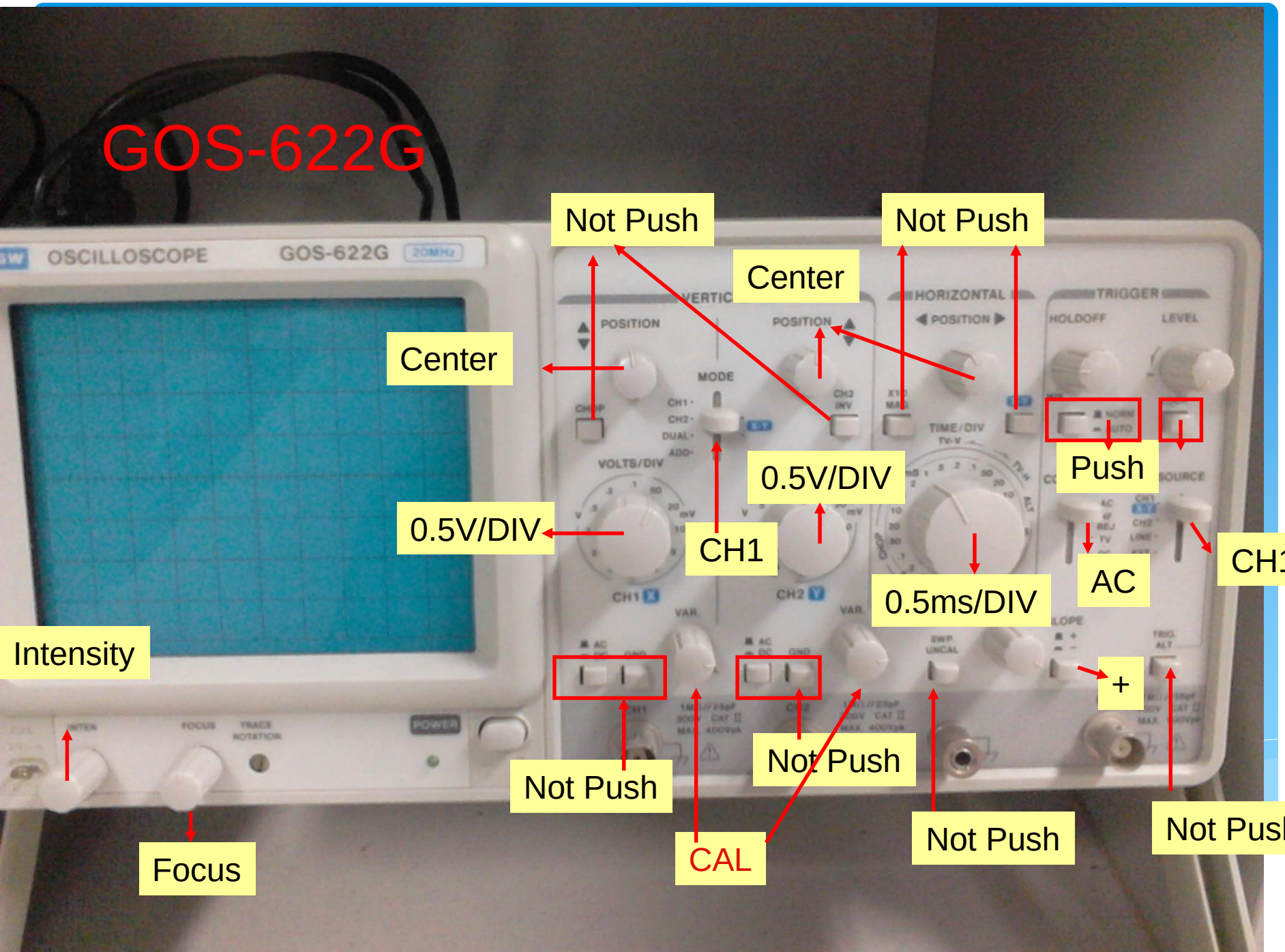
Lab 34. Basic AC Circuit

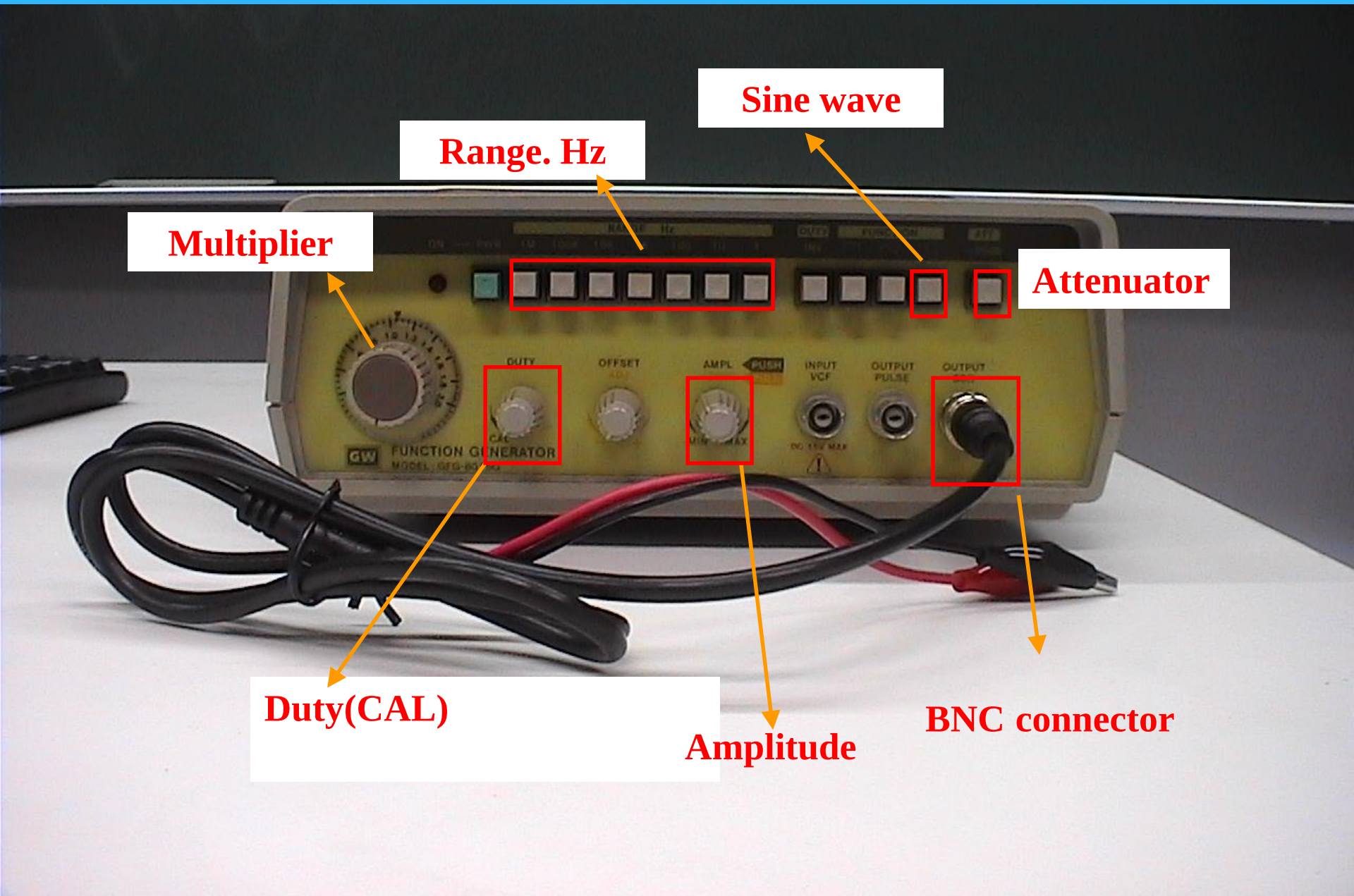
Next Experiment

APP – Magnetic field measurement

Question 1


GOS-622G
OSCILLOSCOPE
GOS-622G
Not Push
Not Push
Center
Center
0.5V/DIV
0.5V/DIV
CH1
Push
AC
CH1
0.5ms/DIV
Intensity
+
Not Push
Not Push
Not Push
Not Push
CAL
Focus

Function Generator



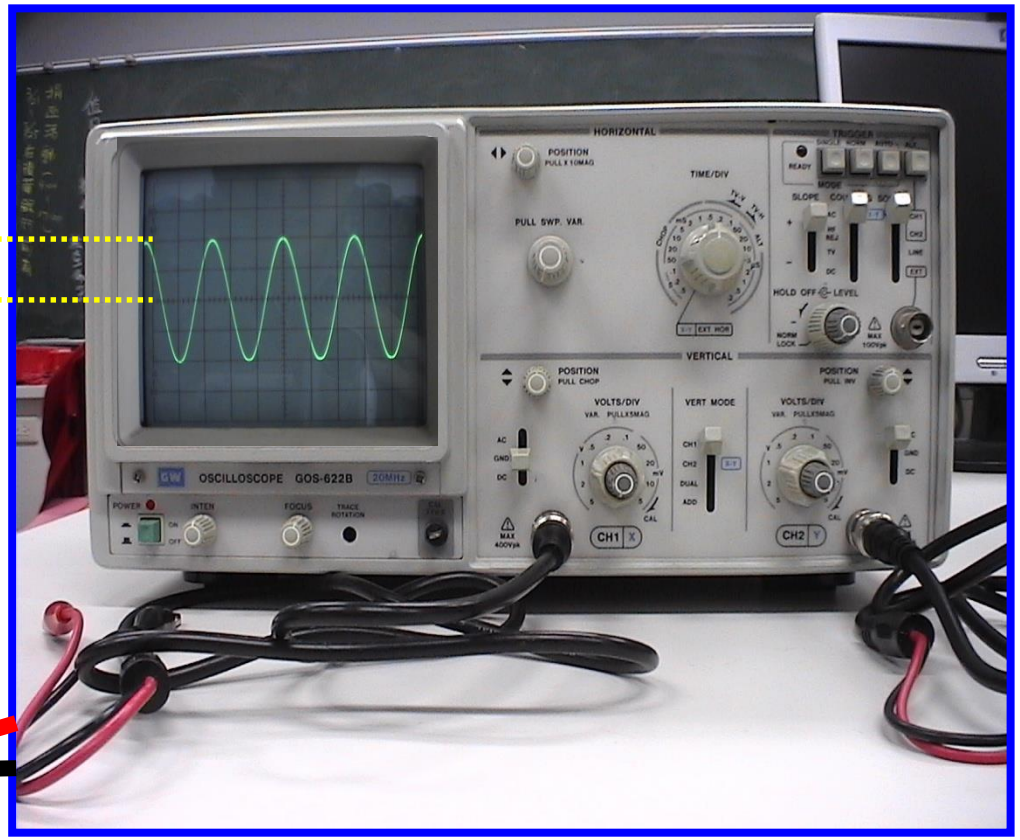
Use an oscilloscope to measure

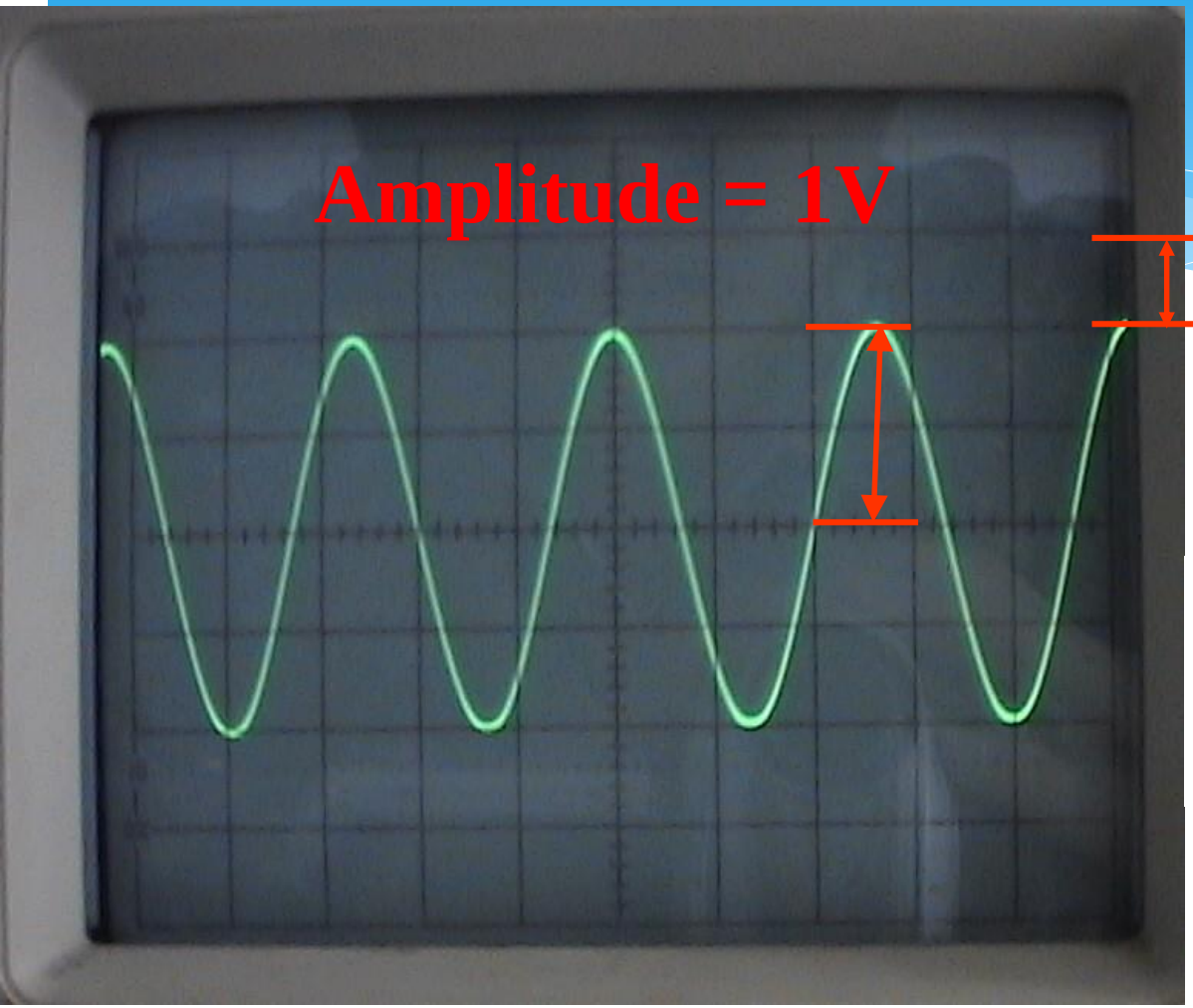
V_R V_L V_C V_i

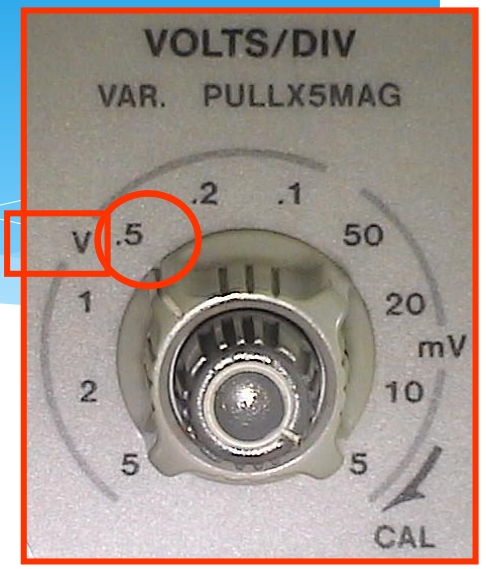
Procedure

(1) Set the amplitude to 5V

5V

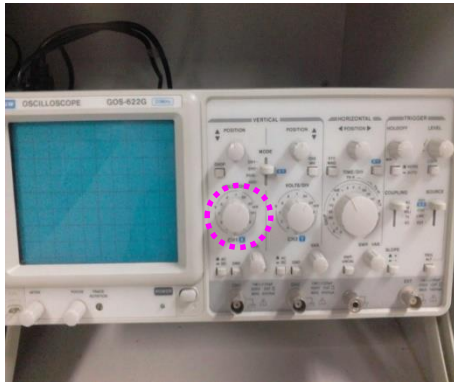






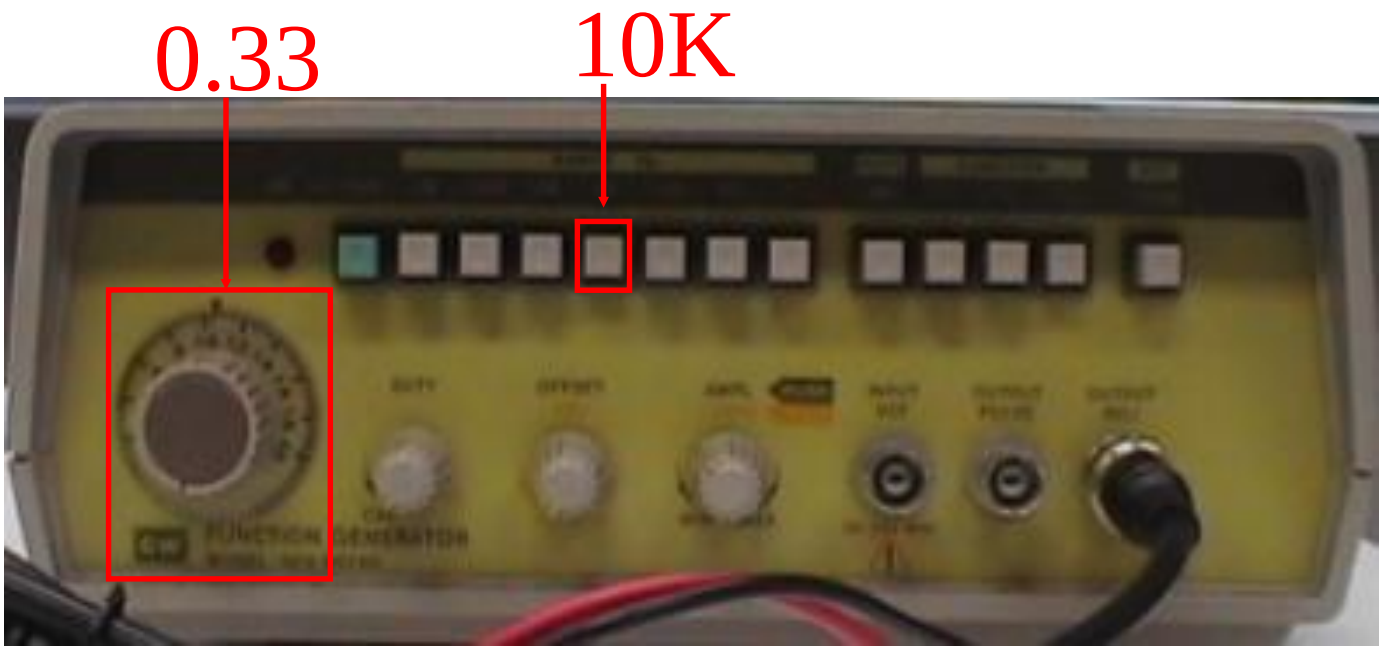
4 divisions 0.5 v/div

Vpp= 4 x 0.5 =2V



Procedure

(2) Set the frequency to 3.3K Hz. Use the multimeter to double-check its value.



3.3K Hz = 10K x 0.33

20K Hz

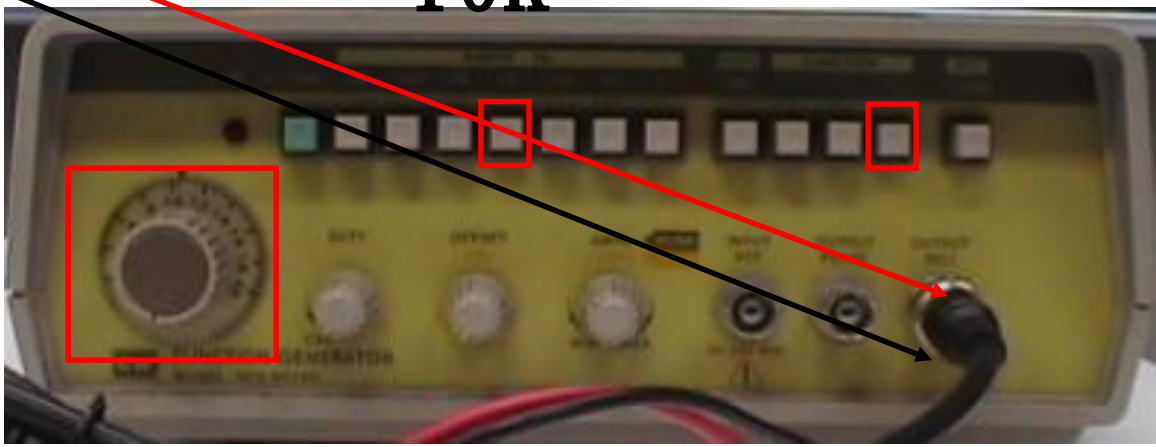
10K

Sine

Frequency

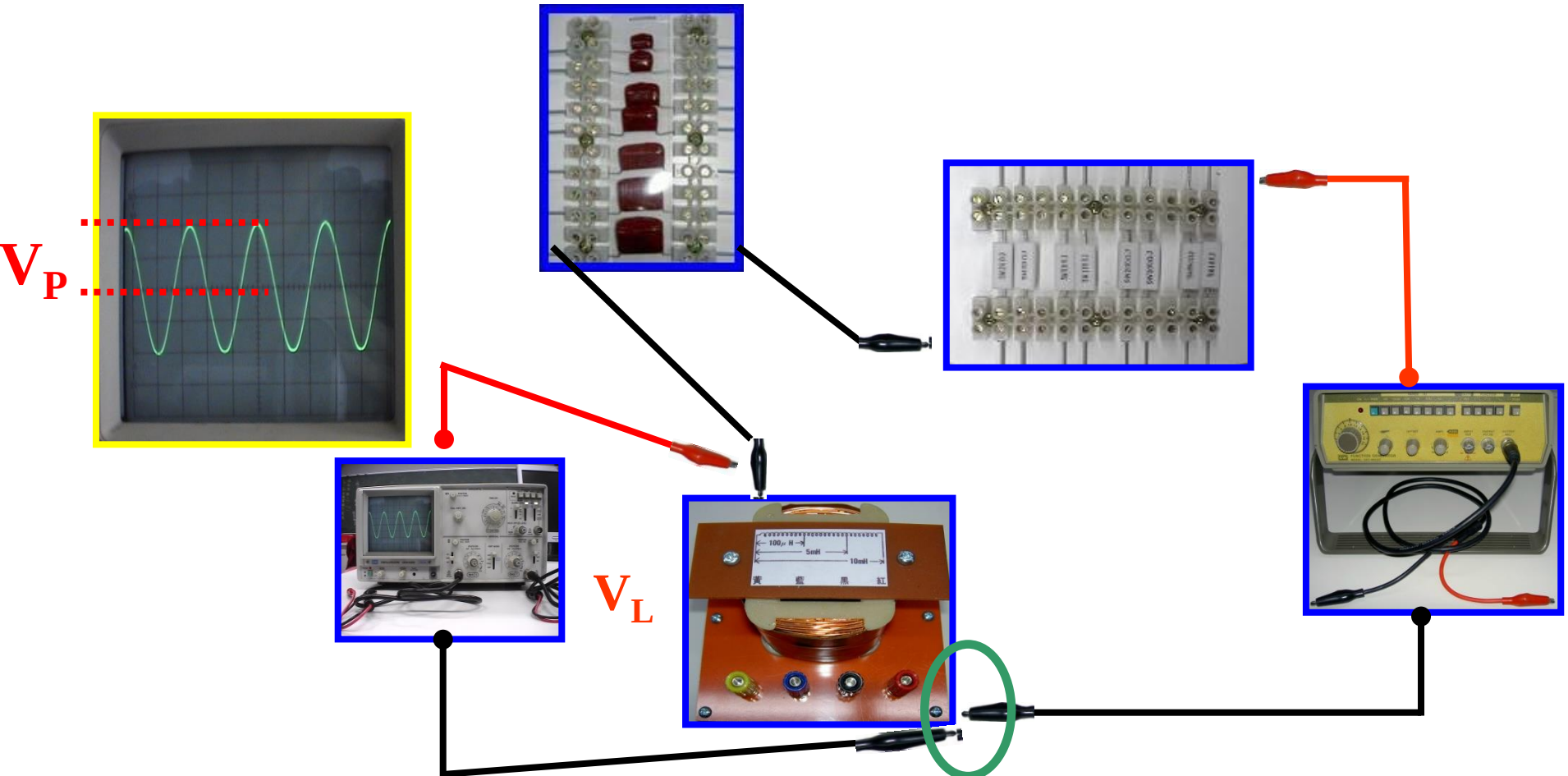
3.3KHz

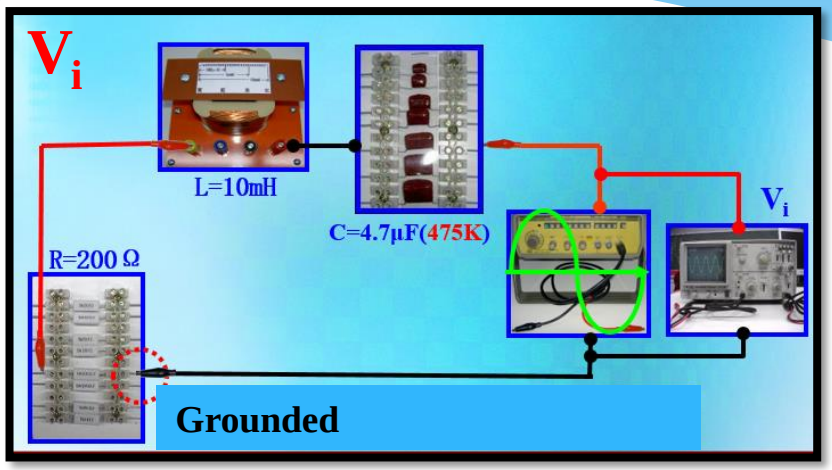
0.33

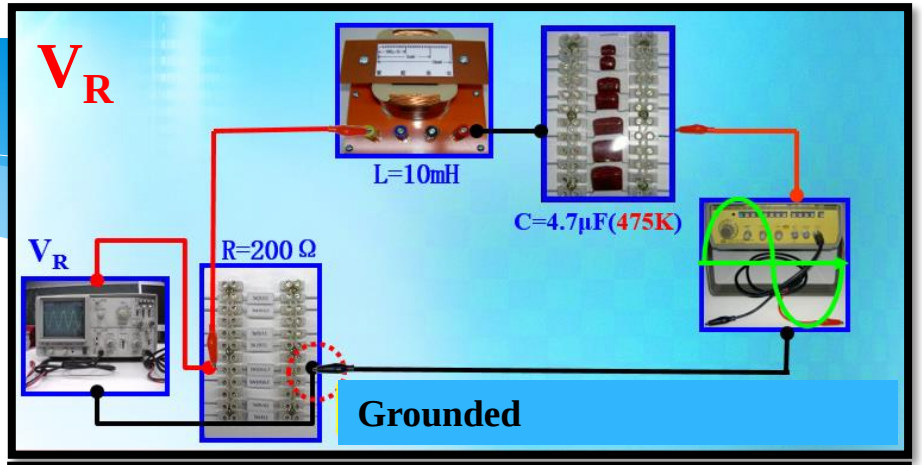


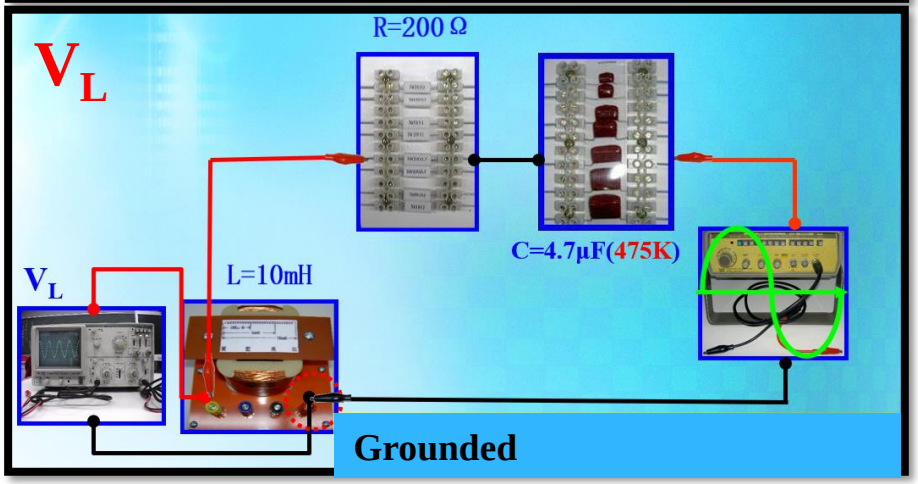
Procedure

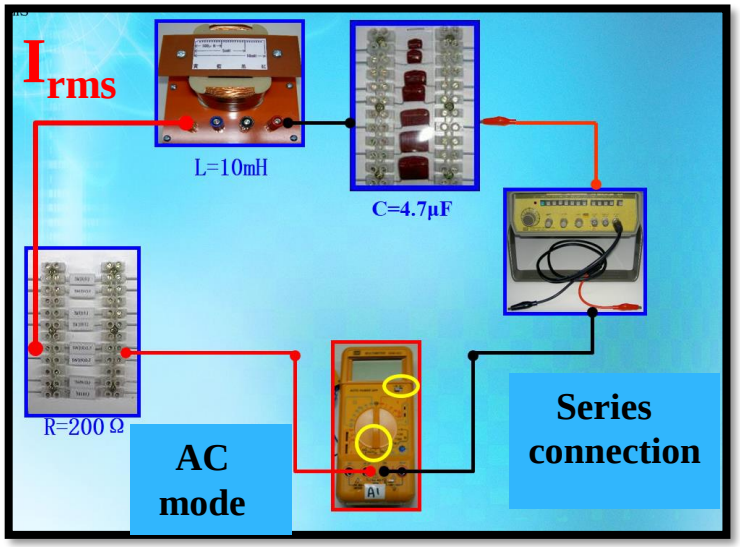
(3) Connect RLC series circuit as below and use an oscilloscope to measure V_R V_L V_C V_i

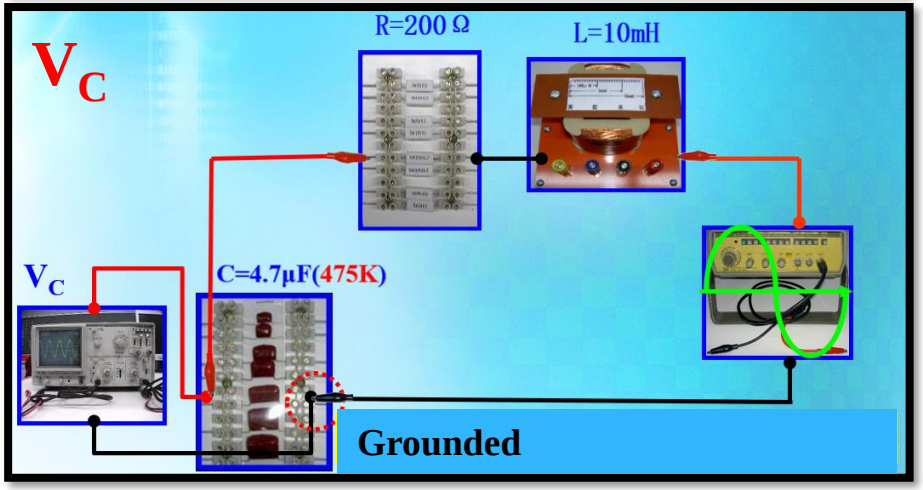



V_i
L=10mH
C=4.7μF(475K)
R=200 Ω
V_i
Grounded


V_R
L=10mH
C=4.7μF(475K)
V_R
R=200 Ω
Grounded


V_L
R=200 Ω
C=4.7μF(475K)
V_L
L=10mH
Grounded


I_{rms}
L=10mH
C=4.7μF
R=200 Ω
AC mode
Series connection


V_C
R=200 Ω
L=10mH
V_C
C=4.7μF(475K)
Grounded

Report Sheet P.34-5

10^{-3} 10^{-6}

(3) $R = 200\ \Omega$，$L = 10$ mH，$C = 4.7\ \mu F$

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

f	V_m (amplitude)						Ω			I_m mA
(Hz)	V_R	V_L	V_C	$\sqrt{V_R^2 + (V_L - V_c)^2}$	V_i	error	X_L	X_C	Z	V_m / Z
										V_i
3.3K	4.8	5	2.5		5					

$$X_L = \omega L \qquad X_C = 1/\omega C \qquad \omega = 2\pi f$$

Use the multimeter to measure

V_R V_L V_C V_i I_{rms}

Vc

V_R

V_L

I_{rms}


MULTIMETER
hFE
E B C E
PNP
NPN
A
10A/20m
200m
2m
200µ
200m
V 2
20
200
600
20M
2M
200K
20K
2K
200
Ω
200
2K
20K
Hz
°C
°F
20µ
2µ
200n
20n
2n
F
OFF
TEMP
TYPE K
CX
10A
µAmA
COM.
VΩHz
UNFUSE
10A MAX.
500mA MAX.
CAT II 600V
600V MAX.
Lutron DM-9090

Report Sheet P.34-5

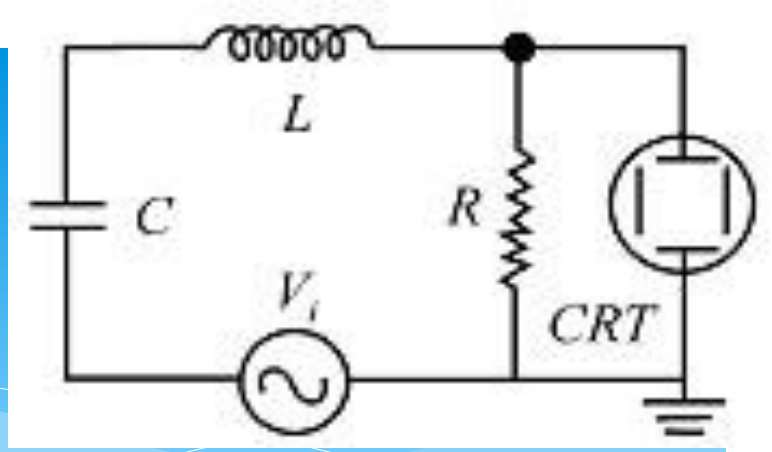
from table 1

f (Hz)	V_{rms}						I_{rms}	$I_m/\sqrt{2}$	error
	V_R	V_L	V_C	$\sqrt{V_R^2+(V_L-V_c)^2}$	V_i	error			
							mA	mA	
3.3K	4.7	5.1	2.6		5		10		

L=10mH

C=4.7uF

R=200Ω



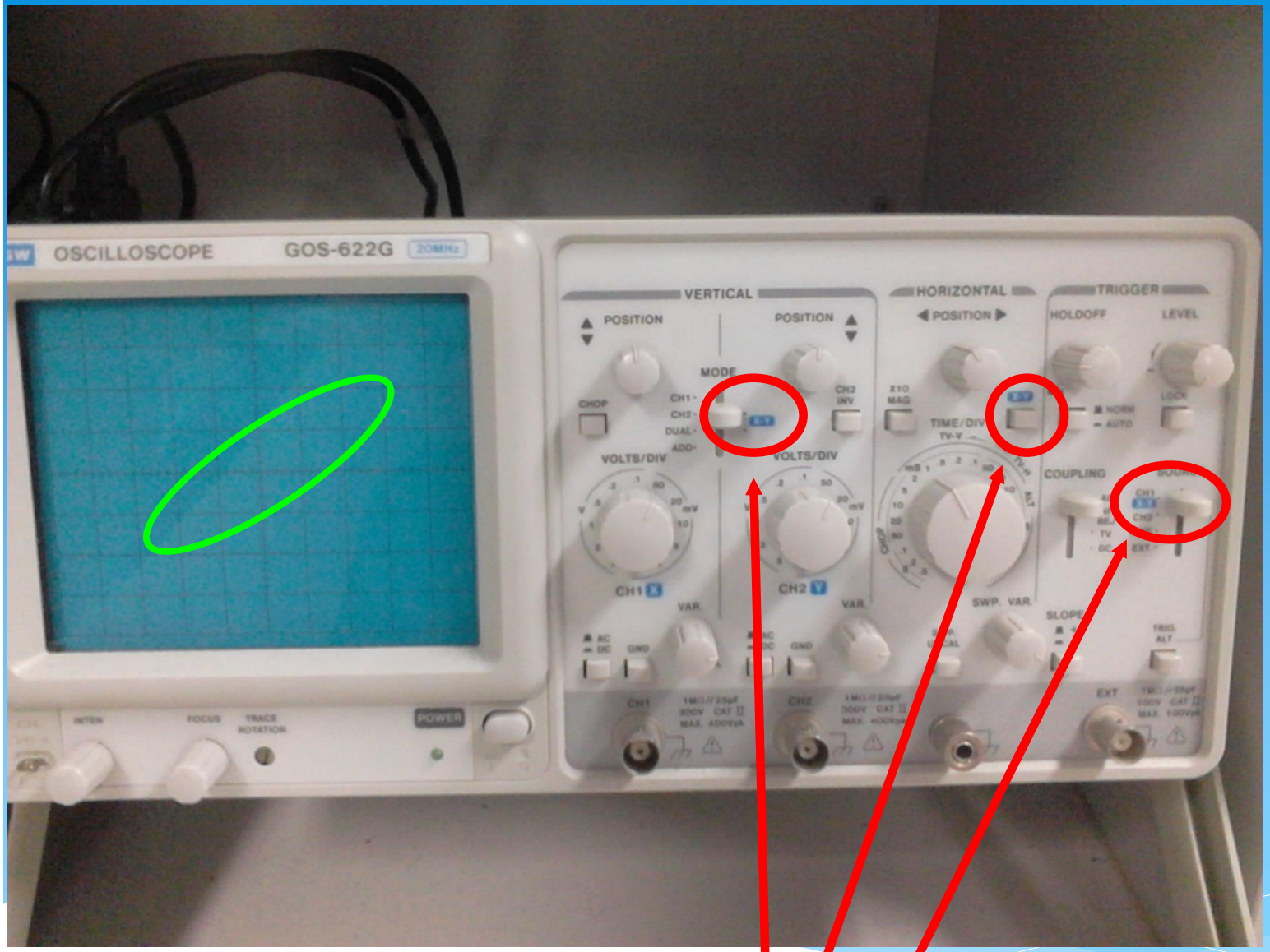
CH1

CH2

CH1

CH2

Ground


OSCILLOSCOPE
GOS-622G
VERTICAL
HORIZONTAL
TRIGGER
POSITION
MODE
VOLTS/DIV
TIME/DIV
COUPLING
HOLDOFF
LEVEL
CH1
CH2
X-Y

Report Sheet P.34-5

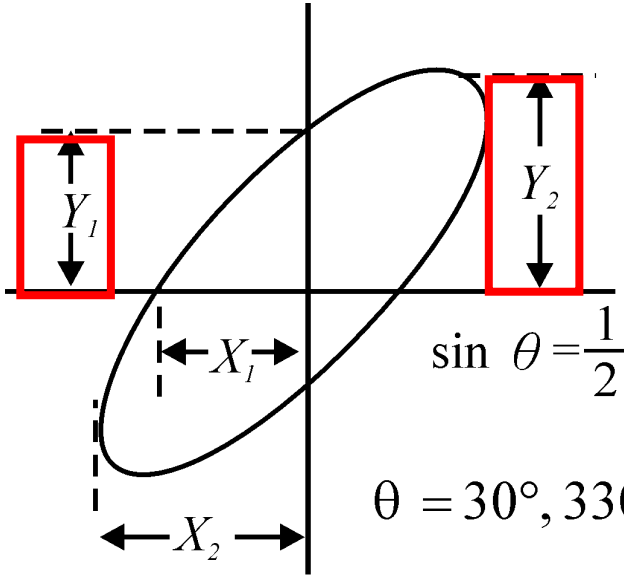
f (Hz)	X_L	X_C	$\tan^{-1}\frac{X_L - X_C}{R}$	Y_1	Y_2	$\sin^{-1}\frac{Y_1}{Y_2}$	error
3.3K			Theoretical	3.5	5	Experimental	
			value			value	

$$X_L = \omega L \qquad X_C = 1/\omega C$$

$$\omega = 2\pi f$$

Use oscilloscope

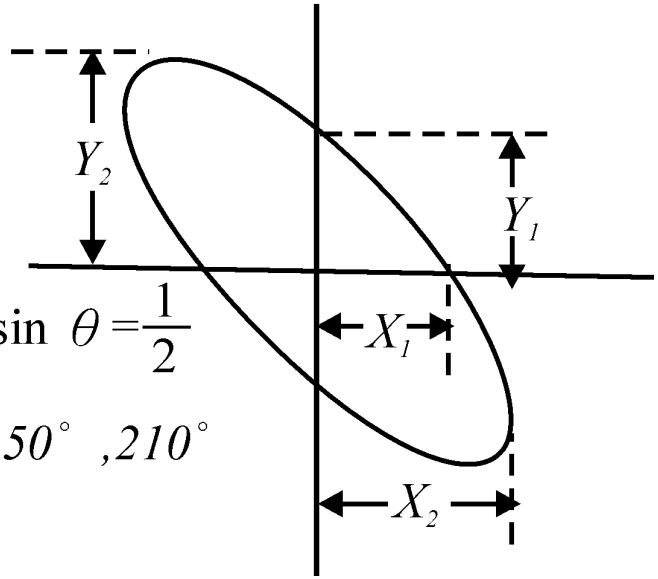
Measure phase difference



$$\sin\theta = \frac{1}{2}$$

$$\theta = 30°, 330°$$

$$\sin\theta = \frac{Y_1}{Y_2} = \frac{X_1}{X_2}$$



$$\sin\theta = \frac{1}{2}$$

$$\theta = 150°, 210°$$