

Ministry of Higher Education and Scientific Research
Salahaddin University-Erbil
College of Education
Department of Physics
1st Stage/ Second Semester
Laboratory of Electricity and Magnetism

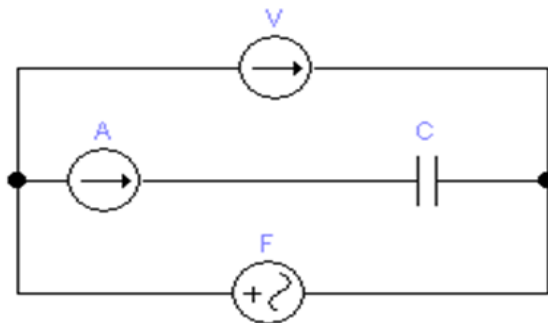


Group ()

Full Name:

Experiment Number: (3)

Name of Experiment: Measurement Capacitance of the Capacitor



Staff Group:

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Experiment No (3)

Measurement Capacitance of the Capacitor

The Purpose of this Experimental:

Using Ohm's law in the A.C circuit, and measuring the capacitance of the capacitor.

Theory:

The capacitive reactance can be obtained simply by using Ohm's law in the same way if we measure any resistance (Ohm's law) in the D.C circuit, therefore:

$$X_C = \frac{V}{I} \dots (1)$$

where (V) represent the voltage applied on the capacitor and (I) is the current passed through the capacitor.

The capacitive reactance depends on the capacitance and the current frequency. If the frequency of the (A.C) current becomes constant the capacitive reactance also becomes constant and do not change with the change of each voltage and current resistance under the Ohm's law conditions.

The relation between the capacitive reactance and the frequency is:

$$X_C = \frac{1}{2\pi f C} \dots (2)$$

where f is the current frequency.

Apparatus:

1. Generator Function.
2. Ammeter (mA)
3. Voltmeter (V)
4. Capacitor (2 μ F, 1 μ F, 0.5 μ F and as you like)
5. Set of wires.

Experimental Method (Procedure):

1. Connect the electrical circuits as shown in figure (1).
2. Make the frequency of the oscillator constant and change the value of the voltmeter, and then record the Ammeter's value.
3. Repeat the step two for difference value of V and I.
4. Change the capacitor and repeat the above step for it.
5. Draw a curve between V (on the Y-axis) and I (on the X-axis) as shown in figure (2).

V/V	I (mA)

6. The slope of the line represent the capacitive reactance (Slope = X_C) and by using equation (2) calculate the capacitance.
7. Repeat the curve and calculations for the second capacitor.
8. Make the voltage constant, and then change the value of the frequency and record the current value.
9. Draw a curve between f (Y-axis) and I (X-axis) then calculate the capacitance (C).

f (Hz)	I (mA)

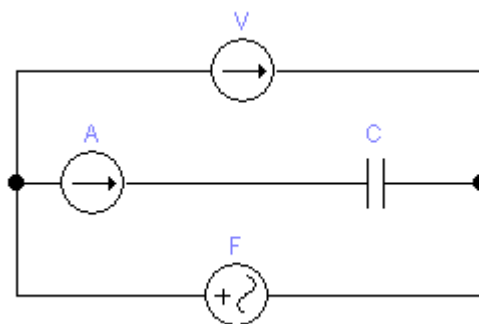


Figure (1): The capacitance circuit.

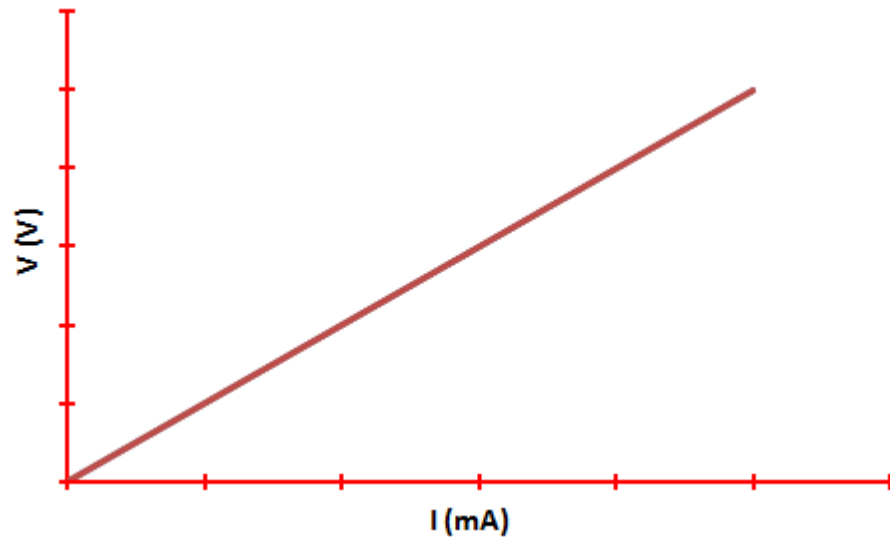


Figure (2): The voltage against of the current.

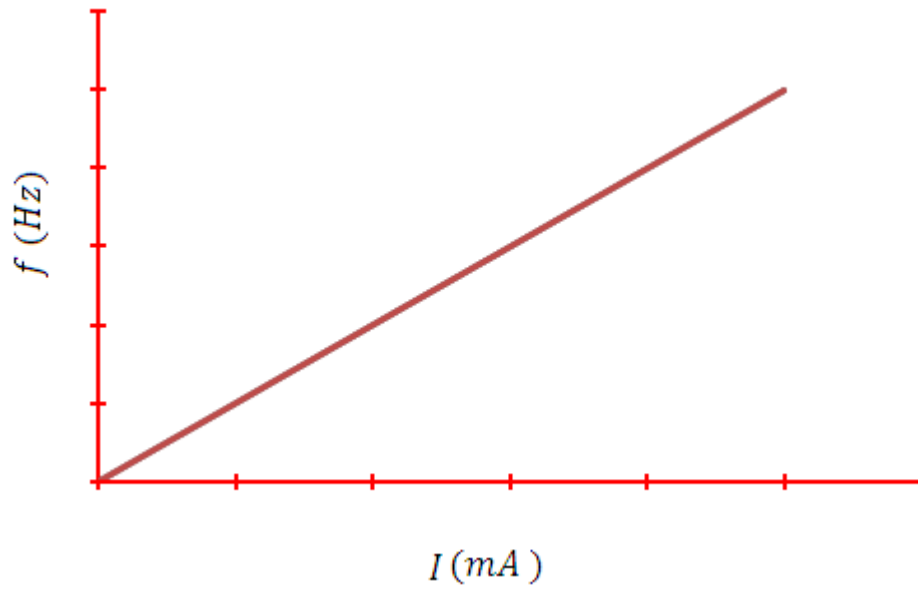


Figure (3): The frequency against of the current.

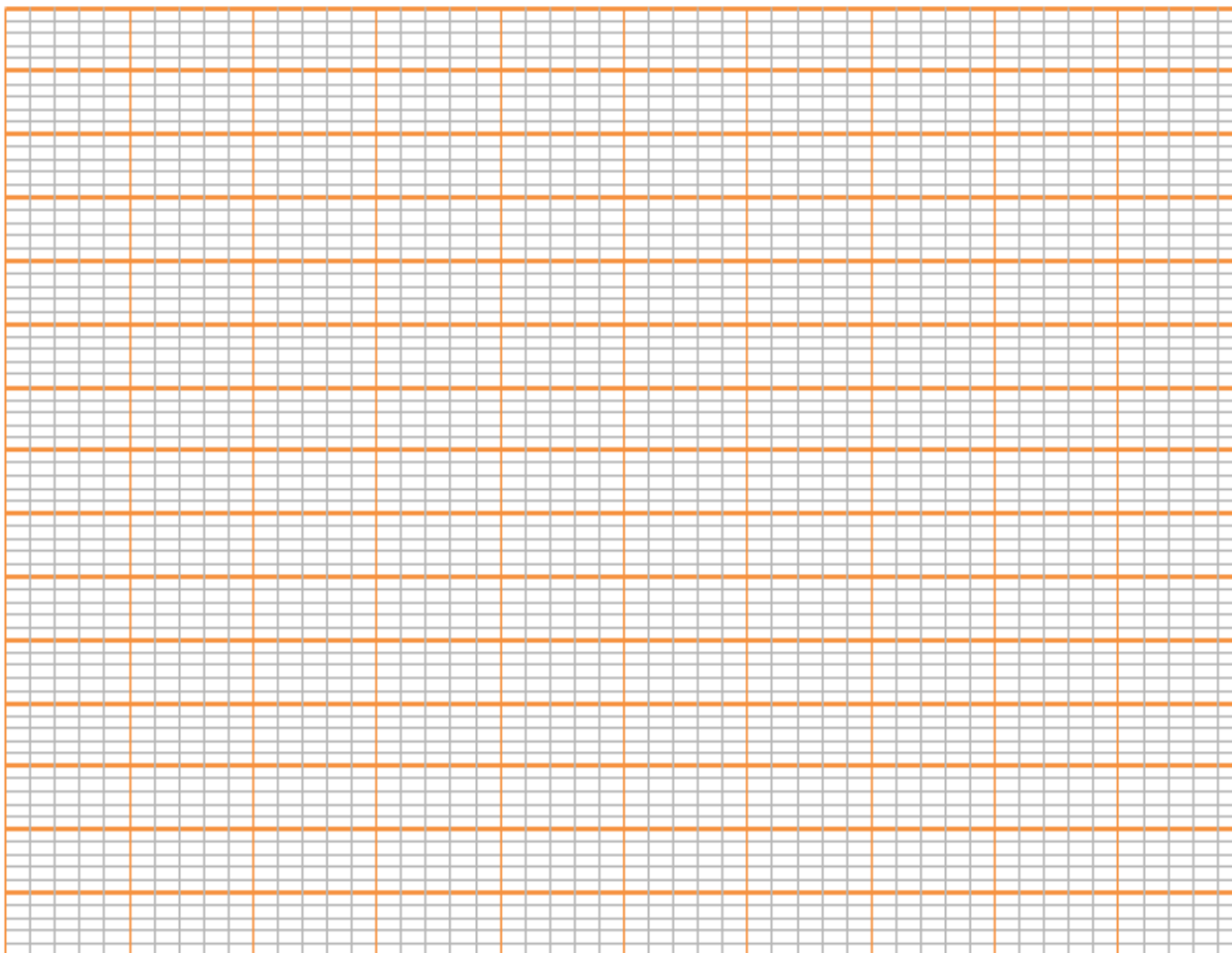
Data and Calculate:

Table 1:

$V_c (V)$	$I (mA)$

C (By using Capacitor)	$C = \dots\dots\dots$
f (By according using)	$f = \dots\dots\dots$
X_c (<i>experiment</i>): (By using slope)	$X_c = Slope = \frac{V_c}{I} = \dots\dots\dots$
C (<i>experiment</i>): (By using slope)	$C = \frac{1}{2\pi f Slope} = \dots\dots\dots$
$Error_C = \varepsilon_C =$	$= \frac{ C_{th} - C_{exp} }{C_{th}} \times 100\%$ $= \frac{ \quad \quad \quad }{\quad \quad \quad} \times 100\%$ $=$

Graph 1:



$$\textit{Slope} = \frac{V_c}{I}$$

$$\textit{Slope} = \text{_____}$$

$$= \text{_____}$$

$$=$$

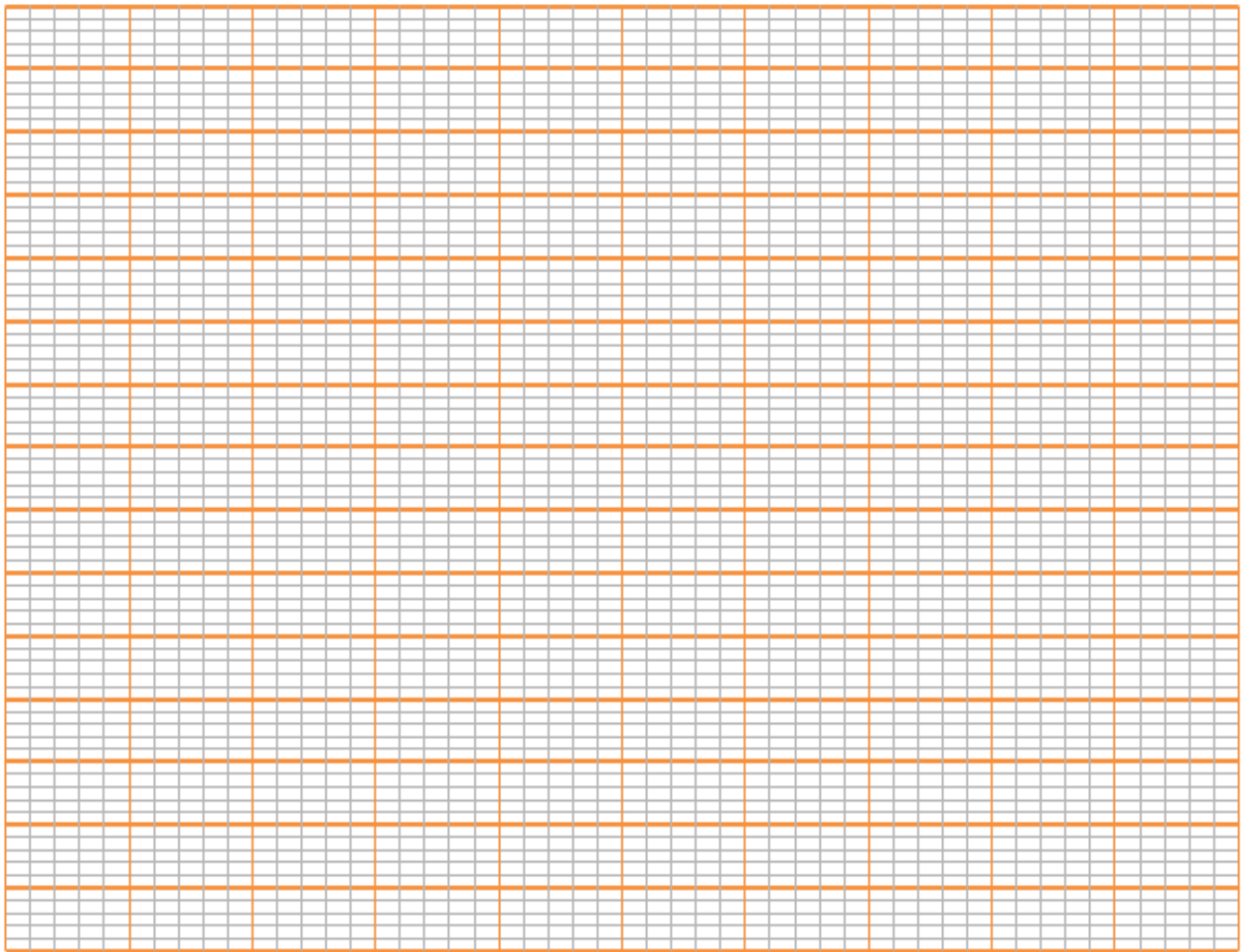
Data and Calculate:

Table 2:

$f(\text{Hz})$	$I(\text{mA})$

C (By using Capacitor)	$C = \dots\dots\dots$
V_c (By according using)	$V_c = \dots\dots\dots$
C (<i>experiment</i>): (By using slope)	$C = \frac{\text{Slope}}{2\pi V_c} = \dots\dots\dots$
$\text{Error}_C = \varepsilon_C =$	$= \frac{ C_{th} - C_{exp} }{C_{th}} \times 100\%$ $= \frac{ \quad \quad \quad }{\quad \quad \quad} \times 100\%$ $=$

Graph 2:



$$\textit{Slope} = \frac{l}{f}$$

$$\textit{Slope} = \text{_____}$$

$$= \text{_____}$$

$$=$$

Result and Discussion:

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