

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

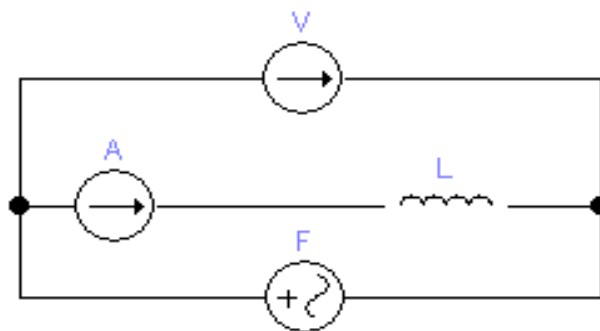


Group ()

Full Name:

Experiment Number: (2)

Name of Experiment: **Measurement Inductance of the Coil**



Staff Group:

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Experiment No (2)

Measurement Inductance of the Coil

The Purpose of this Experimental:

Using Ohm's law in the A.C circuit, and measuring the inductance of the coil.

Theory:

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

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

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

The inductive reactance depends on the inductance and the current frequency. If the frequency of the (A.C) current becomes constant the inductive reactance also becomes constant and do not change with the change of each V and I, as a resistance under the Ohm's law conditions.

The relation between the inductive reactance and the frequency is:

$$X_L = 2\pi fL \dots (2)$$

where f is the current frequency.

Apparatus:

1. Generator Function.
2. Ammeter (mA)
3. Voltmeter (V)
4. Coil (24 mH, 9mH, 2mH and 1mH)
5. Set of wires.

Experimental Method (Procedure):

1. Connect the electrical circuits as show in figure (1).
2. Make the frequency of the oscillator constant and change the value of the voltmeter, then record Ammeter's value.
3. Repeat the step two for difference value of V and I.

V/V	I (mA)

4. Change the coil and repeat the above steps for it.
5. Draw a curve between V (on the Y-axis) and I (on the X-axis) as shown in figure (2).
6. The slope of the line represent the inductive reactance (Slope = X_L) and using the equation (2) calculate the inductance (L).
7. Repeat the curve and calculations for the second coil.
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 1/I (X-axis) then calculate the inductance (L).

f (Hz)	I (mA)	$\frac{1}{I}$ (mA ⁻¹)

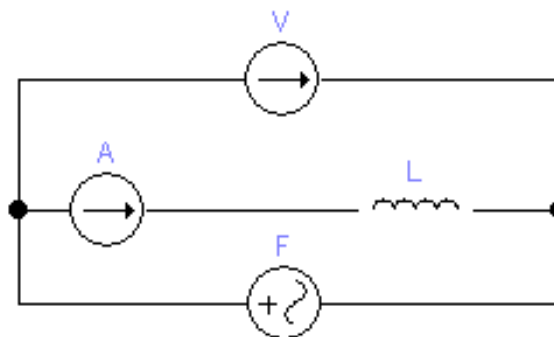


Figure (1): The inductance circuit.

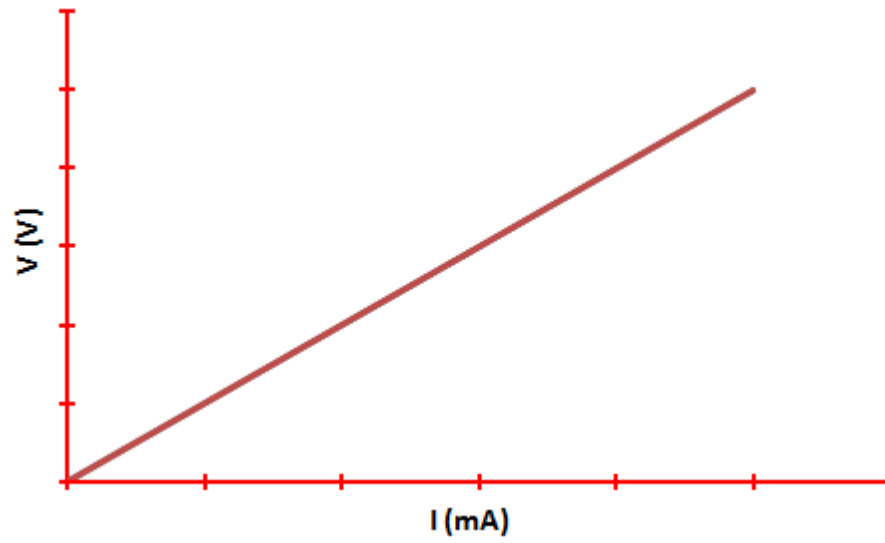


Figure (2): The voltage against of the current.

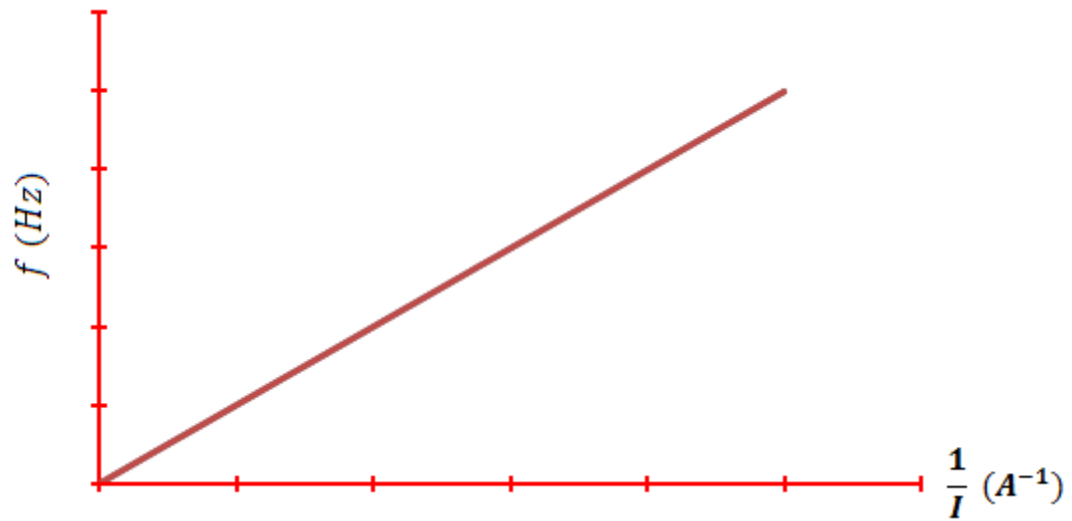


Figure (3): The frequency against of an inverse current.

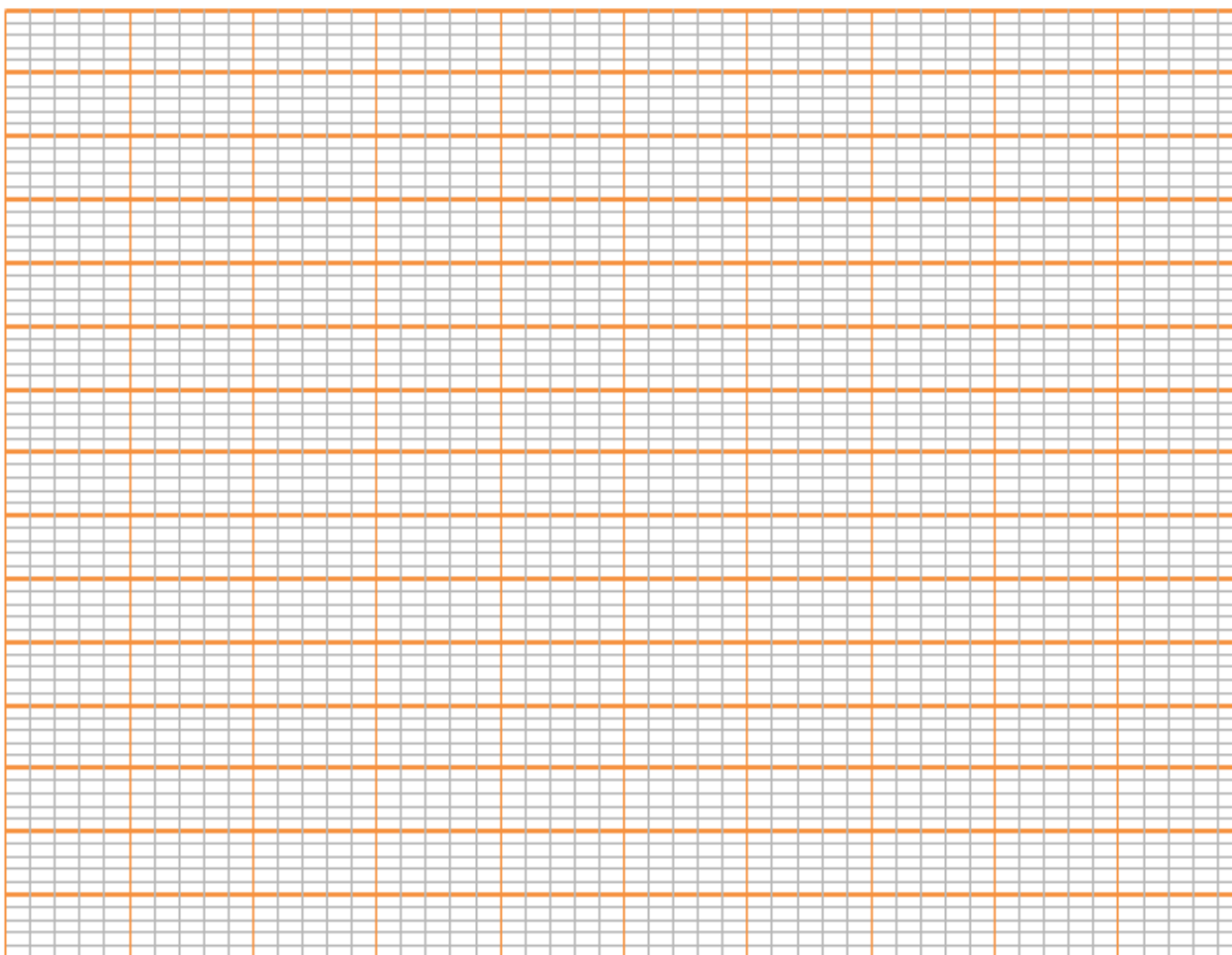
Data and Calculate:

Table 1:

$V_L (V)$	$I (mA)$

L (By using Coil)	$L = \dots\dots\dots$
f (By according using)	$f = \dots\dots\dots$
X_L (<i>experiment</i>): (By using slope)	$X_L = Slope = \frac{V_L}{I} = \dots\dots\dots$
L (<i>experiment</i>): (By using slope)	$L = \frac{Slope}{2\pi f} = \dots\dots\dots$
$Error_L = \varepsilon_L =$	$= \frac{ L_{th} - L_{exp} }{L_{th}} \times 100\%$ $= \frac{ \dots\dots\dots }{\dots\dots\dots} \times 100\%$ $=$

Graph 1:



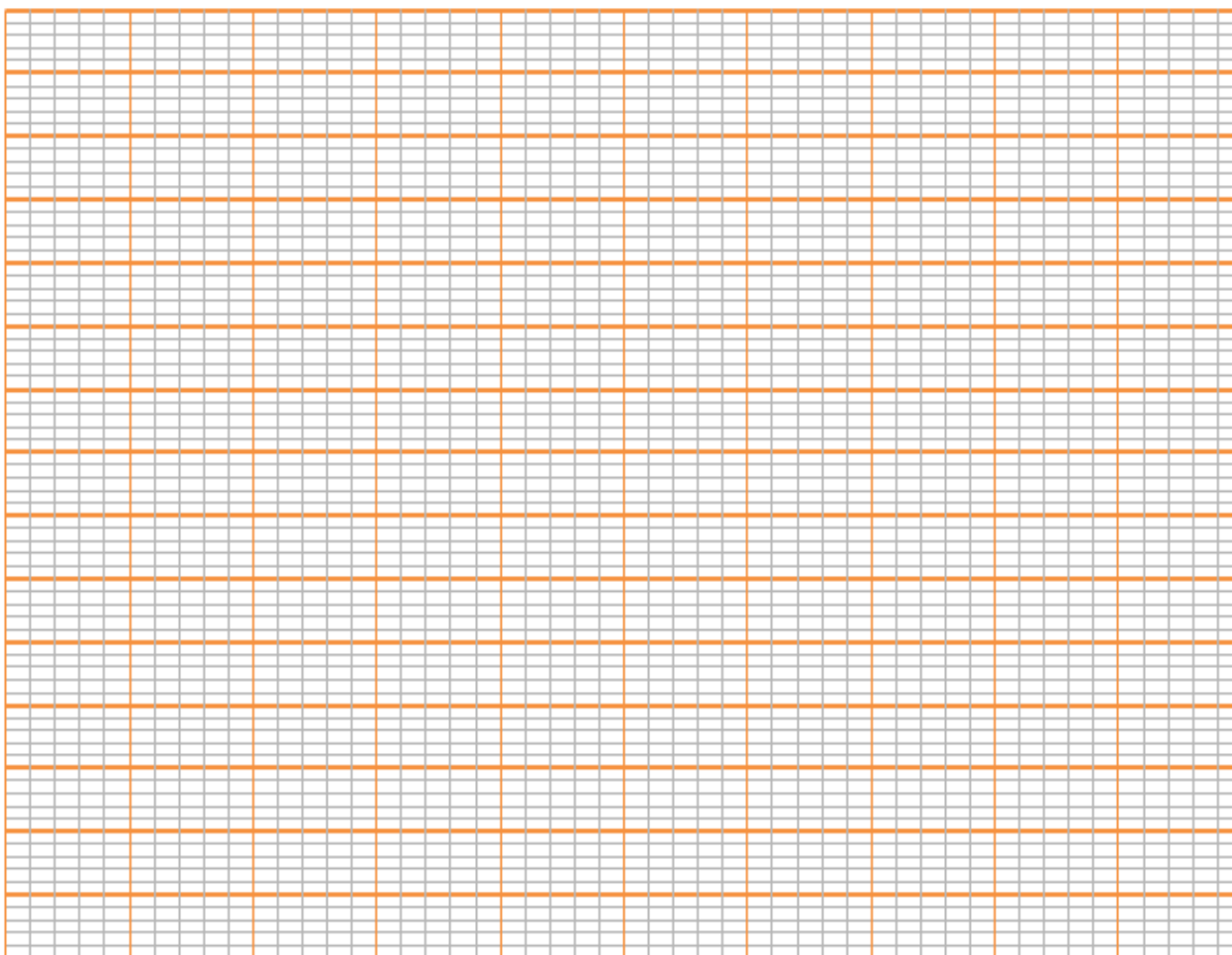
$$\textit{Slope} = \frac{V_L}{I}$$

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

$$= \text{_____}$$

$$=$$

Graph 2:



$$\text{Slope} = \frac{1}{f}$$

$$\text{Slope} = \underline{\hspace{2cm}}$$

$$= \underline{\hspace{2cm}}$$

$$=$$

