

LR Circuits

As you work through the steps in the lab procedure, record your experimental values and the results on this worksheet. Use the exact values you record for your data to make later calculations.

Procedure A: Determining L from time constant

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| CHECKPOINT 1: Ask your TA to check your connections before proceeding. |
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At what time does $\Delta V_R = 0$?

At what time does $\Delta V_R = 0.63\Delta V_f$?

What is the experimental value of the time constant?

What is the total resistance of the circuit?

What is the experimental value of L ?

What is the accepted value of L ?

What is the percent error between the accepted and experimental values of the inductance?

CHECKPOINT 2: Ask your TA to check your data and calculations.

Procedure B: Measuring voltage for increasing current

What final value does the voltage approach?

Complete the table below. (Be sure your data points are all taken from the same curve, and from the rising part of the curve.)

Data Table 1

| ΔV_R (V) | Time (s) | $(\Delta V_f - \Delta V_R)/\Delta V_f$ | $-\ln[(\Delta V_f - \Delta V_R)/\Delta V_f]$ |
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What is the slope of the plot of $-\ln\left(\frac{\Delta V_f - \Delta V}{\Delta V_f}\right)$ versus time? (Your slope should be positive. If it is negative, make sure your data points are all taken from the same curve, and from the rising part of the curve.)

What is the time constant as determined from the slope?

What is the experimental value of L as determined from the slope?

What is the percent error between the accepted and experimental values of the inductance?

CHECKPOINT 3: Ask your TA to check your data, Excel graph, and calculations.

Procedure C: Measuring voltage for decreasing current

What is the initial value of the voltage?

Complete the table below. (Be sure your data points are all taken from the same curve, and from the rising part of the curve.)

Data Table 2

| ΔV_R (V) | Time (s) | $\Delta V_R / \Delta V_0$ | $-\ln[\Delta V_R / \Delta V_0]$ |
|------------------|----------|---------------------------|---------------------------------|
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What is the slope of the plot of $-\ln\left(\frac{\Delta V_R}{\Delta V_0}\right)$ versus time? (Your slope should be positive. If it is negative, make sure your data points are all taken from the same curve, and from the rising part of the curve.)

What is the time constant as determined from the slope?

What is the experimental value of L as determined from the slope?

What is the percent error between the accepted and experimental values of the inductance?

CHECKPOINT 4: Ask your TA to check your data, Excel graph, and calculations.