**Capacitor lab report instructions (for the R-C circuit build lab)**

In this lab we will build an R-C circuit. An R-C circuit is one with resistors and capacitors in it.

Lab goals:

* We learn how a capacitor is charged and holds a charge.
* We compute the ‘theoretical’ Time Constant for the circuit using T = R x C, where ‘T’ is time in seconds, ‘R’ is resistance in ohms, and ‘C’ is capacitance in Farads.
* The Time Constant is the length of time in seconds it takes to charge a capacitor up to 63% of the peak voltage of the battery.
* We then measure and graph time vs. volts, and use the graph to arrive at the ‘measured’ or ‘actual’ Time Constant. Then we compare ‘theoretical’ to ‘measured/actual’.

Your lab report must have these (6) elements:

1. Draw a schematic diagram of the circuit, using the correct symbols and labels.
2. Compute the theoretical Time Constant using T = R x C
3. Show your raw data taken from the circuit. Show it in two columns, Volts and Time.
4. Graph your data on graph paper ([www.printfreegraphpaper.com](http://www.printfreegraphpaper.com)) , with time (s) along the x-axis and volts along the y-axis.
5. Indicated the ‘measured’ Time Constant on the graph.
6. Compare the ‘theoretical’ value to the ‘measured’ value. Calculate the percent error. Discuss the results.

The schematic diagram should look something like this. You can draw it like Figure 2-80 if you prefer.



Calculate the theoretical Time Constant for this circuit. READ LAB HANDOUT P. 77-78!

T = R x C

T = (103 ohms) x (10-3 Farads)

T = 1 second

This means that in 1 second this capacitor should reach 63% of the peak voltage of the battery. The peak voltage of a fresh, 9V battery is around 9.4-9.5 volts.

Here is the raw data I took from my circuit. You will have different values for time, and so your numbers will be different. Everything I am doing here is covered in your lab handout, p. 79. READ IT!



Here’s what my data looks like on a graph (DO THIS ON ACTUAL GRAPH PAPER). Your graph should resemble Figure 2-84.



I have indicated my ‘measured’ Time Constant on the graph in red.

* How did I arrive at this?
* Remember that the Time Constant is the time in seconds it takes to charge up the capacitor to 63% of the peak battery voltage. The peak battery voltage for my 9V battery was actually 9.5 volts, and 9.5 x 0.63 = 5.99 volts, and so the time in seconds it takes to charge up my capacitor to 5.99 volts is the ‘Time Constant’ for that capacitor. Therefore, on my graph I drew a line over from 5.99 volts and down to the x-axis, where it intersected at exactly 1 second. This means my ‘measured’ Time Constant for this particular circuit is 1 second.

Comparison and analysis:

* I calculated a ‘theoretical’ Time Constant of 1 second for this capacitor-resistor combination. I did this by using T = R x C, and plugging in the rated values of my resistor and capacitor. I then arrived at a ‘measured’ or ‘actual’ Time Constant of 1 second as well, by plotting volts vs. time on a graph, and bringing 5.99 volts down to the x-axis.
* Conclusion: I got the same values for ‘theoretical’ and ‘measured’, thereby verifying/confirming the Time Constant formula, T = R x C.
* The rated accuracy of the electronics components used in this circuit are +/- 1 percent, so I’m not surprised that my results were basically identical.