Name_____
Lab Partner(s):_____
Date Performed:_____
Date Due: January 26, 2016
Physics 111 Laboratory
Experiment #2
The Discharge of a Capacitor

*Attach your fully labeled and captioned data tables for each part along with any fully labeled and captioned graphical representations of your data that you may have created to the end of this handout.*

***Honor Code Statement:***

1. From your plot of the potential difference across the capacitor as a function of time, what is the functional form of the decay law for the discharge of the capacitor? What evidence do you have to support this form of the decay law?

2. From your graph of the potential difference across a capacitor as a function of time, what is the experimental value for the capacitive time constant? Call this $\tau_{expt}$. What is the theoretical value of the capacitive time constant using the measured values of R and C? Call this $\tau_{theo}$. How do these two values compare?

3. From your graph of the potential difference across the capacitor as a function of time, what is the constant of proportionality between the potential difference and the time? What does this value equate to in your experimental setup? How do the two values compare?

4. From your graph of the capacitive time constant as a function of the circuit resistance what is the functional form of the time constant as a function of the resistance? Experimentally why did you use a power law curve fit to the data? Is a power law curve fit what should be used? What experimental evidence can you cite to show that a power law is the best choice of curve fit? What is the exponent of R and is the exponent what is predicted by theory? What is the constant of proportionality and how does it compare to the capacitance?

5. From your graph of the capacitive time constant as a function of capacitance what is the functional form of the time constant as a function of the capacitance? Experimentally why did you use a power law curve fit to the data? Is a power law curve fit what should be used? What experimental evidence can you cite to show that a power law is the best choice of curve fit? What is the exponent of C and is the exponent what is predicted by theory? What is the constant of proportionality and how does it compare to the resistance?

6. Using your results from parts 4 and 5, what is the functional form for the capacitive time constant?

7. For the situation in which you wired your capacitors in series, does the effective capacitance add according to $\frac{1}{C_{eff}} = \sum_{i=1}^{N} \frac{1}{C_i}$? Justify your answer with experimental evidence.

8. For the situation in which you wired your capacitors in parallel, does the effective capacitance add according to $C_{eff} = \sum_{i=1}^{N} C_i$? Justify your answer with experimental evidence.