Charge and Discharge

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: Time constant for an RC circuit

CHECKPOINT 1: Ask your TA to check your circuit connections before proceeding.

What is the time when $\Delta V = 0$?

What is the time when $\Delta V = 0.632\Delta V_f$?

What is the value of RC?

What is the accepted value of R?

What is the accepted value of C?

What is the experimental value of C?

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

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

Procedure B: Calculation of Capacitance by Graphical Method

When charging the capacitor, what final value ΔV_f does the voltage approach?

Complete the table below. For accuracy in later calculations, be sure to enter your values to at least three decimal places.

Data Table 1

ΔV (V)	Time (s)	$(\Delta V_f - \Delta V)/\Delta V_f$	$-\ln[(\Delta V_f - \Delta V)/V_f]$

What is the slope of the $-\ln\left(\frac{\Delta V_f - \Delta V}{V_f}\right)$ vs. time graph?

What is the time constant?

What is the value of the capacitance as calculated from the slope?

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

CHECKPOINT 3: Ask your TA to check your data and calculations before proceeding.

Procedure C: Measuring Effective Capacitance

What is the accepted value of R?

What is the accepted value of second capacitor C_2?

What is the theoretical value of the effective capacitance of the parallel combination?

What is the value of the initial voltage for the discharging process?

Complete the table below. For accuracy in later calculations, be sure to enter your values to at least three decimal places.

Data Table 2

ΔV (V)	Time (s)	$\Delta V/\Delta V_0$	$-\ln(\Delta V/\Delta V_0)$

What is the slope of the $-\ln\left(\frac{\Delta V}{\Delta V_0}\right)$ vs. time graph?

What is the time constant?

What is the effective capacitance of the parallel combination as calculated from the slope?

What is the percent error between the experimental and theoretical values of C_{eff}?

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