

Name: \_\_\_\_\_

Date of Lab: \_\_\_\_\_

Partner: \_\_\_\_\_

Do not use pen. Do not adjust units.

Power Supply setting  $V_{\max}$  (use voltmeter):  $V_{\max} =$  \_\_\_\_\_ V

Nominal Value of your capacitor:  $C_{\text{nom}} =$  \_\_\_\_\_ mF

Value of your resistor (from ohmmeter):  $R =$  \_\_\_\_\_  $\pm$  \_\_\_\_\_ k $\Omega$

Nominal time constant  $\tau = RC$ :  $\tau_{\text{nom}} =$  \_\_\_\_\_ s ( $\tau_{\text{goal}} \approx 90 - 110$  s)

**Part I: Discharging**

$V(t) = V_{\max} e^{-\frac{t}{RC}}$	$\ln(V) = \frac{-t}{RC} + \ln(V_{\max})$
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Slope of  $\ln(V)$  vs.  $t$ :  $slope =$  \_\_\_\_\_  $\pm$  \_\_\_\_\_  $\text{ks}^{-1}$

Intercept of  $\ln(V)$  vs.  $t$ :  $intercept =$  \_\_\_\_\_  $\pm$  \_\_\_\_\_ -

Computed  $V_{\max}$  from intercept:  $V_{\max} =$  \_\_\_\_\_  $\pm$  \_\_\_\_\_ V

Computed time constant:  $\tau_1 =$  \_\_\_\_\_  $\pm$  \_\_\_\_\_ seconds

Computed capacitance:  $C_1 =$  \_\_\_\_\_  $\pm$  \_\_\_\_\_ mF

**Part II: Charging**

$V(t) = V_{\max} \left( 1 - e^{-\frac{t}{RC}} \right)$	$\ln\left(1 - \frac{V}{V_{\max}}\right) = \frac{-t}{RC}$	$r = \frac{e^n}{e^n - 1}$	$V_{\max} = rV_{\text{final}}$	$f = 1 - \frac{V}{V_{\max}}$
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$t_{\text{final}} =$  \_\_\_\_\_ s       $V_{\text{final}} =$  \_\_\_\_\_ V       $n = t_{\text{final}}/\tau_1 =$  \_\_\_\_\_

$r =$  \_\_\_\_\_       $V_{\max} \approx$  \_\_\_\_\_ V

Slope of  $\ln(f)$  vs.  $t$ :  $slope =$  \_\_\_\_\_  $\pm$  \_\_\_\_\_  $\text{ks}^{-1}$

Computed time constant:  $\tau_2 =$  \_\_\_\_\_  $\pm$  \_\_\_\_\_ seconds

Computed capacitance:  $C_2 =$  \_\_\_\_\_  $\pm$  \_\_\_\_\_ mF

Discuss what you think is the best value for  $C$ : \_\_\_\_\_