Name: ____________________ Date of Lab: _______________

Partner: ____________________

Also due next week: A paper abstract. Focus only on the discharging capacitor, not charging. Submit your Excel sheet to CANVAS. Please make sure all four graphs are nicely formatted. All other calculations and data should be professional, clear, and labeled.

		Part 1: Discharging Capacitor	**Part 2: Charging Capacitor**
Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω		
Time constant (from *V* vs. *t* graph)	s		
Slope of ln(*V*) vs *t*	1/s	±	±
Time constant (from ln(*V*) vs *t* graph)	s	±	±
Experimental capacitance	μF	±	±
Manufacturer's capacitance	μF		

Do your time constants agree with one another (within uncertainty)? Do you expect them to? Comment.

Do your experimental capacitance measurements agree with one another? Do they agree with the manufacturer's capacitance (within uncertainty)? Do you expect them to? Comment

Here are some hints about how to do the data analysis for the capacitance lab:

		Part 1: Discharging Capacitor	**Part 2: Charging Capacitor**
Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω	No uncertainty required.	No uncertainty required.
Time constant (from V vs. t graph)	s	First find target voltage: $V_{\text{target}} = V_0/e = 0.368\ V_0$ Find the time for the voltage measurement nearest to V_{target}. This is τ. No uncertainty required.	First find target voltage: $V_{\text{target}} = V_0\,(1 - 1/e) = 0.632\ V_0$ Find the time for the voltage measurement nearest to V_{target}. This is τ. No uncertainty required.
Slope of semi-log plot	1/s	From linest for ln(V) vs t. Include uncertainty recorded in presentation format.	From linest for ln($V_0 - V$) vs t. Include uncertainty recorded in presentation format.
Time constant (from ln(V) vs t graph)	s	τ = 1/slope from above. Uncertainty is given by: $\Delta\tau = \frac{\tau\Delta(slope)}{slope}$	τ = 1/slope from above. Uncertainty is given by: $\Delta\tau = \frac{\tau\Delta(slope)}{slope}$
Experimental capacitance	μF	Use τ from above: $C = \frac{\tau}{R}$. Convert to μF for table. The uncertainty is: $\Delta C = \frac{C\Delta(slope)}{slope}$	Use τ from above: $C = \frac{\tau}{R}$. Convert to μF for table. The uncertainty is: $\Delta C = \frac{C\Delta(slope)}{slope}$
Manufacturer's capacitance	μF	No uncertainty required.	No uncertainty required.

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		Part 1: Discharging Capacitor	**Part 2: Charging Capacitor**
Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω		
Time constant (from *V* vs. *t* graph)	s		
Slope of ln(*V*) vs *t*	1/s	±	±
Time constant (from ln(*V*) vs *t* graph)	s	±	±
Experimental capacitance	μF	±	±
Manufacturer's capacitance	μF		

Do your time constants agree with one another (within uncertainty)? Do you expect them to? Comment.

Do your experimental capacitance measurements agree with one another? Do they agree with the manufacturer's capacitance (within uncertainty)? Do you expect them to? Comment

Here are some hints about how to do the data analysis for the capacitance lab:

		Part 1: Discharging Capacitor	**Part 2: Charging Capacitor**
Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω	No uncertainty required.	No uncertainty required.
Time constant (from *V* vs. *t* graph)	s	First find target voltage: $V_{target} = V_0/e = 0.368\ V_0$ Find the time for the voltage measurement nearest to V_{target}. This is τ. No uncertainty required.	First find target voltage: $V_{target} = V_0\ (1 - 1/e) = 0.632\ V_0$ Find the time for the voltage measurement nearest to V_{target}. This is τ. No uncertainty required.
Slope of semi-log plot	1/s	From linest for ln(V) vs t. Include uncertainty recorded in presentation format.	From linest for ln($V_0 - V$) vs t. Include uncertainty recorded in presentation format.
Time constant (from ln(V) vs t graph)	s	τ = 1/slope from above. Uncertainty is given by: $\Delta\tau = \frac{\tau\Delta(slope)}{slope}$	τ = 1/slope from above. Uncertainty is given by: $\Delta\tau = \frac{\tau\Delta(slope)}{slope}$
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Manufacturer's capacitance	μF	No uncertainty required.	No uncertainty required.

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Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω		
Time constant (from *V* vs. *t* graph)	s		
Slope of ln(*V*) vs *t*	1/s	±	±
Time constant (from ln(*V*) vs *t* graph)	s	±	±
Experimental capacitance	μF	±	±
Manufacturer's capacitance	μF		

Do your time constants agree with one another (within uncertainty)? Do you expect them to? Comment.

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		Part 1: Discharging Capacitor	**Part 2: Charging Capacitor**
Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω	No uncertainty required.	No uncertainty required.
Time constant (from V vs. t graph)	s	First find target voltage: $V_{\text{target}} = V_0/e = 0.368\ V_0$ Find the time for the voltage measurement nearest to V_{target}. This is τ. No uncertainty required.	First find target voltage: $V_{\text{target}} = V_0\,(1 - 1/e) = 0.632\ V_0$ Find the time for the voltage measurement nearest to V_{target}. This is τ. No uncertainty required.
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Time constant (from ln(V) vs t graph)	s	τ = 1/slope from above. Uncertainty is given by: $\Delta\tau = \frac{\tau\Delta(slope)}{slope}$	τ = 1/slope from above. Uncertainty is given by: $\Delta\tau = \frac{\tau\Delta(slope)}{slope}$
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Manufacturer's capacitance	μF	No uncertainty required.	No uncertainty required.

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		Part 1: Discharging Capacitor	**Part 2: Charging Capacitor**
Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω		
Time constant (from *V* vs. *t* graph)	s		
Slope of ln(*V*) vs *t*	1/s	±	±
Time constant (from ln(*V*) vs *t* graph)	s	±	±
Experimental capacitance	μF	±	±
Manufacturer's capacitance	μF		

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Here are some hints about how to do the data analysis for the capacitance lab:

		Part 1: Discharging Capacitor	**Part 2: Charging Capacitor**
Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω	No uncertainty required.	No uncertainty required.
Time constant (from *V* vs. *t* graph)	s	First find target voltage: $V_{target} = V_0/e = 0.368\ V_0$ Find the time for the voltage measurement nearest to V_{target}. This is τ. No uncertainty required.	First find target voltage: $V_{target} = V_0\ (1 - 1/e) = 0.632\ V_0$ Find the time for the voltage measurement nearest to V_{target}. This is τ. No uncertainty required.
Slope of semi-log plot	1/s	From linest for ln(*V*) vs *t*. Include uncertainty recorded in presentation format.	From linest for ln(V_0 – *V*) vs *t*. Include uncertainty recorded in presentation format.
Time constant (from ln(*V*) vs *t* graph)	s	τ = 1/slope from above. Uncertainty is given by: $\Delta\tau = \frac{\tau\Delta(slope)}{slope}$	τ = 1/slope from above. Uncertainty is given by: $\Delta\tau = \frac{\tau\Delta(slope)}{slope}$
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Manufacturer's capacitance	μF	No uncertainty required.	No uncertainty required.

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		Part 1: Discharging Capacitor	**Part 2: Charging Capacitor**
Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω		
Time constant (from *V* vs. *t* graph)	s		
Slope of ln(*V*) vs *t*	1/s	±	±
Time constant (from ln(*V*) vs *t* graph)	s	±	±
Experimental capacitance	μF	±	±
Manufacturer's capacitance	μF		

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Here are some hints about how to do the data analysis for the capacitance lab:

		Part 1: Discharging Capacitor	Part 2: Charging Capacitor
Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω	No uncertainty required.	No uncertainty required.
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Manufacturer's capacitance	μF	No uncertainty required.	No uncertainty required.

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		Part 1: Discharging Capacitor	**Part 2: Charging Capacitor**
Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω		
Time constant (from *V* vs. *t* graph)	s		
Slope of ln(*V*) vs *t*	1/s	±	±
Time constant (from ln(*V*) vs *t* graph)	s	±	±
Experimental capacitance	μF	±	±
Manufacturer's capacitance	μF		

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Do your experimental capacitance measurements agree with one another? Do they agree with the manufacturer's capacitance (within uncertainty)? Do you expect them to? Comment

Here are some hints about how to do the data analysis for the capacitance lab:

		Part 1: Discharging Capacitor	**Part 2: Charging Capacitor**
Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω	No uncertainty required.	No uncertainty required.
Time constant (from *V* vs. *t* graph)	s	First find target voltage: $V_{\text{target}} = V_0/e = 0.368\ V_0$ Find the time for the voltage measurement nearest to V_{target}. This is τ. No uncertainty required.	First find target voltage: $V_{\text{target}} = V_0\ (1 - 1/e) = 0.632\ V_0$ Find the time for the voltage measurement nearest to V_{target}. This is τ. No uncertainty required.
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Manufacturer's capacitance	µF	No uncertainty required.	No uncertainty required.

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		Part 1: Discharging Capacitor	**Part 2: Charging Capacitor**
Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω		
Time constant (from *V* vs. *t* graph)	s		
Slope of ln(*V*) vs *t*	1/s	±	±
Time constant (from ln(*V*) vs *t* graph)	s	±	±
Experimental capacitance	μF	±	±
Manufacturer's capacitance	μF		

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Here are some hints about how to do the data analysis for the capacitance lab:

		Part 1: Discharging Capacitor	Part 2: Charging Capacitor
Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω	No uncertainty required.	No uncertainty required.
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Manufacturer's capacitance	μF	No uncertainty required.	No uncertainty required.

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		Part 1: Discharging Capacitor	**Part 2: Charging Capacitor**
Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω		
Time constant (from *V* vs. *t* graph)	s		
Slope of ln(*V*) vs *t*	1/s	±	±
Time constant (from ln(*V*) vs *t* graph)	s	±	±
Experimental capacitance	μF	±	±
Manufacturer's capacitance	μF		

Do your time constants agree with one another (within uncertainty)? Do you expect them to? Comment.

Do your experimental capacitance measurements agree with one another? Do they agree with the manufacturer's capacitance (within uncertainty)? Do you expect them to? Comment

Here are some hints about how to do the data analysis for the capacitance lab:

		Part 1: Discharging Capacitor	**Part 2: Charging Capacitor**
Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω	No uncertainty required.	No uncertainty required.
Time constant (from *V* vs. *t* graph)	s	First find target voltage: $V_{target} = V_0/e = 0.368\ V_0$ Find the time for the voltage measurement nearest to V_{target}. This is τ. No uncertainty required.	First find target voltage: $V_{target} = V_0\ (1 - 1/e) = 0.632\ V_0$ Find the time for the voltage measurement nearest to V_{target}. This is τ. No uncertainty required.
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Manufacturer's capacitance	μF	No uncertainty required.	No uncertainty required.

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Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω		
Time constant (from *V* vs. *t* graph)	s		
Slope of ln(*V*) vs *t*	1/s	±	±
Time constant (from ln(*V*) vs *t* graph)	s	±	±
Experimental capacitance	μF	±	±
Manufacturer's capacitance	μF		

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Here are some hints about how to do the data analysis for the capacitance lab:

		Part 1: Discharging Capacitor	**Part 2: Charging Capacitor**
Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω	No uncertainty required.	No uncertainty required.
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Manufacturer's capacitance	μF	No uncertainty required.	No uncertainty required.

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Resistor value (from ohmmeter)	Ω		
Time constant (from *V* vs. *t* graph)	s		
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Time constant (from ln(*V*) vs *t* graph)	s	±	±
Experimental capacitance	μF	±	±
Manufacturer's capacitance	μF		

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Here are some hints about how to do the data analysis for the capacitance lab:

		Part 1: Discharging Capacitor	Part 2: Charging Capacitor
Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
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Manufacturer's capacitance	μF	No uncertainty required.	No uncertainty required.

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		Part 1: Discharging Capacitor	**Part 2: Charging Capacitor**
Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω		
Time constant (from *V* vs. *t* graph)	s		
Slope of ln(*V*) vs *t*	1/s	±	±
Time constant (from ln(*V*) vs *t* graph)	s	±	±
Experimental capacitance	μF	±	±
Manufacturer's capacitance	μF		

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Here are some hints about how to do the data analysis for the capacitance lab:

		Part 1: Discharging Capacitor	**Part 2: Charging Capacitor**
Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
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Name: ____________________ Date of Lab: _______________

Partner: ____________________

Also due next week: A paper abstract. Focus only on the discharging capacitor, not charging.
Submit your Excel sheet to CANVAS. Please make sure all four graphs are nicely formatted.
All other calculations and data should be professional, clear, and labeled.

		Part 1: Discharging Capacitor	**Part 2: Charging Capacitor**
Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω		
Time constant (from *V* vs. *t* graph)	s		
Slope of ln(*V*) vs *t*	1/s	±	±
Time constant (from ln(*V*) vs *t* graph)	s	±	±
Experimental capacitance	μF	±	±
Manufacturer's capacitance	μF		

Do your time constants agree with one another (within uncertainty)? Do you expect them to? Comment.

Do your experimental capacitance measurements agree with one another? Do they agree with the manufacturer's capacitance (within uncertainty)? Do you expect them to? Comment

Here are some hints about how to do the data analysis for the capacitance lab:

Quantity	**Unit**	**Part 1: Discharging Capacitor** **Value ± Uncertainty**	**Part 2: Charging Capacitor** **Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω	No uncertainty required.	No uncertainty required.
Time constant (from *V* vs. *t* graph)	s	First find target voltage: $V_{\text{target}} = V_0/e = 0.368\ V_0$ Find the time for the voltage measurement nearest to V_{target}. This is τ. No uncertainty required.	First find target voltage: $V_{\text{target}} = V_0\,(1 - 1/e) = 0.632\ V_0$ Find the time for the voltage measurement nearest to V_{target}. This is τ. No uncertainty required.
Slope of semi-log plot	1/s	From linest for ln(V) vs t. Include uncertainty recorded in presentation format.	From linest for ln($V_0 - V$) vs t. Include uncertainty recorded in presentation format.
Time constant (from ln(V) vs t graph)	s	τ = 1/slope from above. Uncertainty is given by: $\Delta\tau = \frac{\tau\Delta(slope)}{slope}$	τ = 1/slope from above. Uncertainty is given by: $\Delta\tau = \frac{\tau\Delta(slope)}{slope}$
Experimental capacitance	μF	Use τ from above: $C = \frac{\tau}{R}$. Convert to μF for table. The uncertainty is: $\Delta C = \frac{C\Delta(slope)}{slope}$	Use τ from above: $C = \frac{\tau}{R}$. Convert to μF for table. The uncertainty is: $\Delta C = \frac{C\Delta(slope)}{slope}$
Manufacturer's capacitance	μF	No uncertainty required.	No uncertainty required.

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Time constant (from V vs. t graph)	s		
Slope of ln(V) vs t	1/s	±	±
Time constant (from ln(V) vs t graph)	s	±	±
Experimental capacitance	μF	±	±
Manufacturer's capacitance	μF		

Do your time constants agree with one another (within uncertainty)? Do you expect them to? Comment.

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Here are some hints about how to do the data analysis for the capacitance lab:

		Part 1: Discharging Capacitor	**Part 2: Charging Capacitor**
Quantity	**Unit**	**Value ± Uncertainty**	**Value ± Uncertainty**
Resistor value (from ohmmeter)	Ω	No uncertainty required.	No uncertainty required.
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Slope of semi-log plot	1/s	From linest for $\ln(V)$ vs t. Include uncertainty recorded in presentation format.	From linest for $\ln(V_0 - V)$ vs t. Include uncertainty recorded in presentation format.
Time constant (from $\ln(V)$ vs t graph)	s	τ = 1/slope from above. Uncertainty is given by: $\Delta\tau = \frac{\tau\Delta(slope)}{slope}$	τ = 1/slope from above. Uncertainty is given by: $\Delta\tau = \frac{\tau\Delta(slope)}{slope}$
Experimental capacitance	μF	Use τ from above: $C = \frac{\tau}{R}$. Convert to μF for table. The uncertainty is: $\Delta C = \frac{C\Delta(slope)}{slope}$	Use τ from above: $C = \frac{\tau}{R}$. Convert to μF for table. The uncertainty is: $\Delta C = \frac{C\Delta(slope)}{slope}$
Manufacturer's capacitance	μF	No uncertainty required.	No uncertainty required.