CIRCUITS DAY 15: LAB: MEASURE THE RC TIME CONSTANT

CED 11.8 · Skills 3.A/2.D · FRQ: ED · bounded investigation

RETRIEVAL — NO DEMO

If R doubles while C stays fixed, predict the time constant: **halves / doubles / stays the same**.

INVESTIGATION QUESTION

Does the time constant measured from a charging or discharging trace agree with $\tau = RC$?
Use at least three RC combinations and retain a lab record.

Safety: observe capacitor polarity and voltage rating. Disconnect the source and discharge through a resistor before changing the circuit.

NOTES / REASONING

BOUNDED PROCEDURE

1. Build the checked low-voltage series RC circuit.
2. Record R and C with units; calculate RC.
3. Record V_C versus time during one charge or discharge.
4. For charging, locate 0.63V_final. For discharging, locate 0.37V_initial. The corresponding time is measured τ.
5. Repeat for at least three RC combinations.

Your controls: state the source voltage, start/stop rule, discharge rule, and how you will repeat an uncertain trial.

DATA RECORD

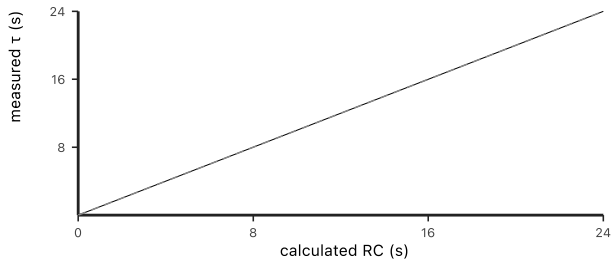
Raw-record requirement: keep or attach a time-and-(V_C) table for every RC combination. The summary table below does not replace those raw records.

trial	R (Ω)	C (F)	RC (s)	landmark V (V)	measured τ (s)
1					
2					
3					
4					

Trace: graph at least one V_C(t) run and mark the 63% or 37% intersection.

ANALYSIS AND CLAIM

TEST PROPORTIONALITY



1. Plot measured τ vertically against calculated RC horizontally. Add the ideal $y = x$ comparison.

2. Describe the slope and intercept expected if τ=RC.

3. Identify one uncertainty that changes the measured τ.

Do not fit an exponential or linearize ln V; those methods are outside this investigation.