

ANALYSIS AND DISCUSSION

Part I: Discharging of a Capacitor

1. In the first part of the experiment, you measured the voltage drop across a capacitor while discharging. Generate a graphical representation of your data. Describe (in about 100 words) your observation and the data collected.
2. The appropriate fit equation to your data has the general form $A \cdot \exp(-Cx) + B$.
3. Do your data for the discharging of the capacitor support the proposed theory? Provide detailed discussion (about 400 words) in this regard. In your discussion, make sure that you indicate the limitations of your experiment and the possible sources of error.
4. From the appropriate curve fit to your data find the time constant (τ) for the discharging process and estimate the internal resistance (r) of the Voltmetre.

Part II: Charging of a Capacitor

1. In the second part of the experiment, you measured the voltage drop across the capacitor while charging. Generate a graphical representation of your data. Describe (in about 100 words) your observation and the data collected.
2. You should be careful, when analyzing this part of the experiment, especially when comparing your data with the expected formula. This is because the formula in the theory for a charging capacitor, assumes that the Voltmetre's internal resistance is much larger than the other resistance in the circuit. Since this is not the case here, a modified version of that formula applies. The relevant formula, whose derivation is beyond the scope of this course, is

$$V = \frac{r}{r+R} V_0 \left(1 - e^{-\frac{t}{R'c}} \right)$$

Where

$$R' = \frac{rR}{R+r}$$

Note that when $r \gg R$ the above formula reduces to the one stated in the theory.

3. Does your data for the charging of the capacitor is as predicted by the equation above? Provide detailed discussion (about 400 words) in this regard. In your discussion, make sure that you indicate the limitations of your experiment and the possible sources of error.