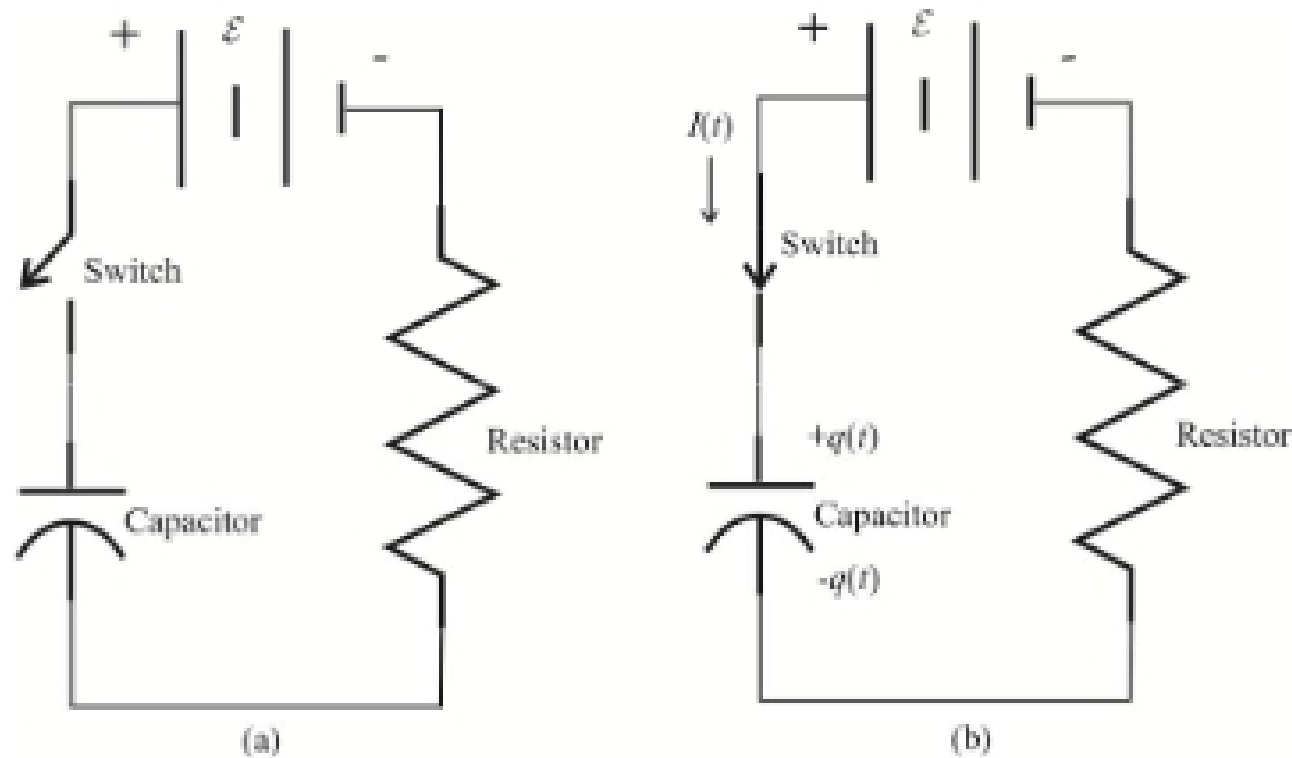


# Experiment EC3: RC Circuits

In this experiment you will accomplish the following tasks:

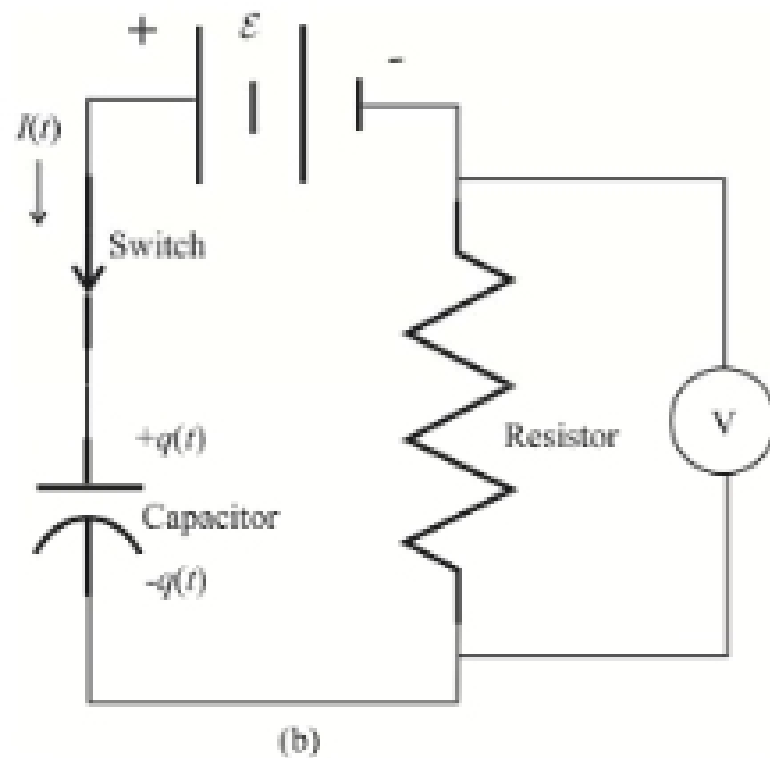
- 1) Study the charging of a capacitor through a resistor.
- 2) Study the discharging of a capacitor through a resistor.
- 3) Study the way capacitance adds in both series and parallel arrangements.



Consider the circuit above. In (a), the capacitor is uncharged and no current flows because the switch is open. In (b), current begins to flow charging the capacitor. As the charge  $q(t)$  builds over time on the capacitor, the voltage across it also increases.

As the voltage across the capacitor increases, the voltage across the resistor decreases.

# V-1 Charging through a resistor



As charge builds up on the capacitor, the voltage across the resistor decreases.

The voltage across the resistor is given by:

$$V_R = \mathcal{E} e^{-\frac{t}{\tau}}$$

Taking the natural logarithm of both sides of this equation gives:

$$\ln|V_R| = \ln|\mathcal{E}| - \frac{t}{\tau}$$

The time constant  $\tau$  is given by  $\tau = RC$ .