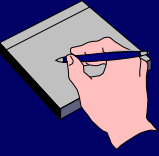


# RC Circuits: Charging



The switches are originally open and the capacitor is uncharged. Then switch  $S_1$  is closed.

- **Loop:**  $\varepsilon - I(t)R - q(t) / C = 0$
- **Just after...:**  $q = q_0$ 
  - Capacitor is uncharged
  - $\varepsilon - I_0 R = 0 \Rightarrow I_0 = \varepsilon / R$
- **Long time after:**  $I_c = 0$ 
  - Capacitor is fully charged
  - $\varepsilon - q_\infty / C = 0 \Rightarrow q_\infty = \varepsilon C$
- **Intermediate (more complex)**  
 $q(t) = q_\infty(1 - e^{-t/RC})$   
 $I(t) = I_0 e^{-t/RC}$

