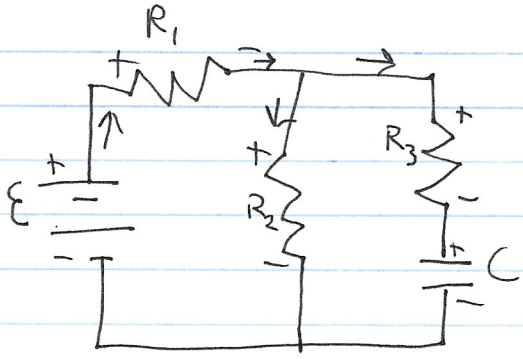
Discussion 16

$\mathcal{E} = 100\,V$ $\quad C = 2.0\,\mu F$

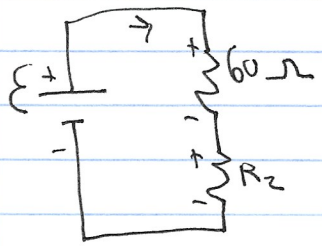
$R_1 = 60\,\Omega$

$R_2 = 40\,\Omega$ $\quad Q_0 = 0$

$R_3 = 10\,\Omega$



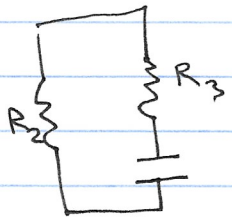
a.)



b.) $I_{R_3} = 0$ $\quad I_{R_2 \text{ or } R_1} = \frac{100\,V}{100\,\Omega} = 1.0\,A$

c.) $Q = V_c(C) = 40\,V(2.0\,\mu F) = 80\,\mu C$ $\quad (V_c = \mathcal{E} - \Delta V_{R_1})$

d.)



e.) $Q_i = Q_0 = 80\,\mu C$

f.) $R_{eq} = 50\,\Omega$ $\quad I = \frac{40\,V}{50\,\Omega} = 0.8\,A$

g.) $Q = Q_0 e^{-t/\tau} \rightarrow \frac{Q}{Q_0} = \frac{1}{10} = e^{-t/\tau} \rightarrow \ln\left(\frac{1}{10}\right) = -t/\tau \rightarrow t = -\tau \ln\left(\frac{1}{10}\right)$

$\therefore t = -50\,\Omega(2.0\,\mu F)\ln\left(\frac{1}{10}\right) = -100\ln\left(\frac{1}{10}\right) = 0.23\,ms$

h.) $\tau = RC = 50\,\Omega \cdot 2.0\,\mu F = 100\,s$

i.) $P = IV = \frac{V^2}{R} = 0.8A(40V) = 320\,\Omega$ $\quad 0.8A(40V) = 32\,W$