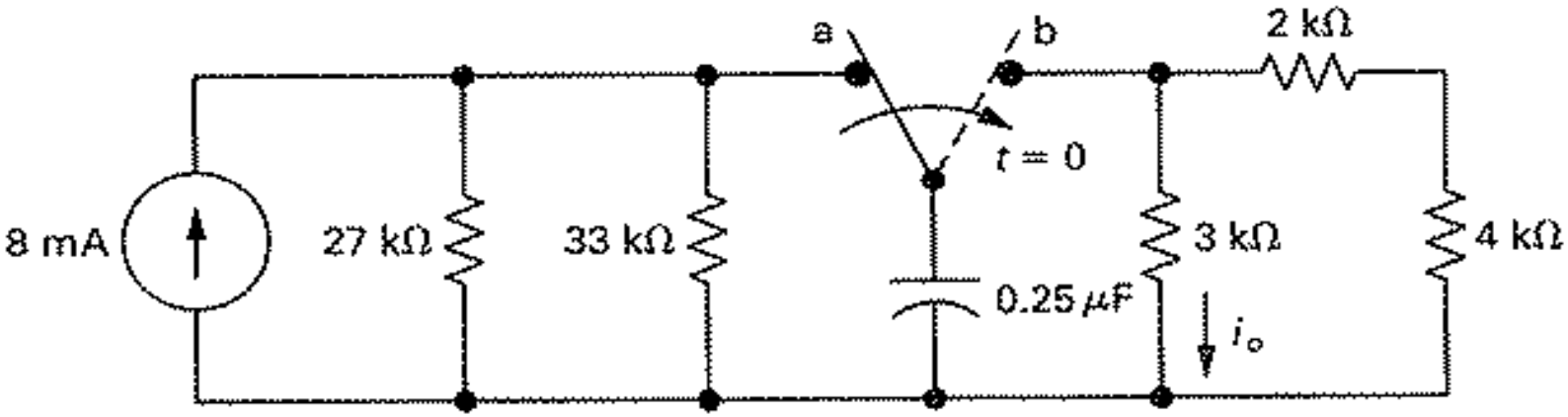
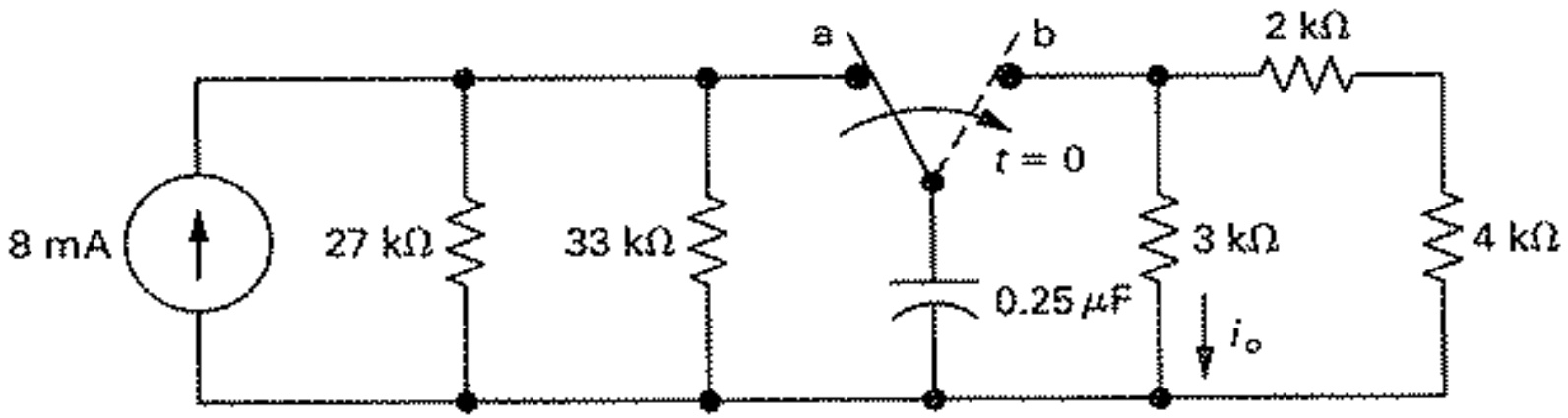
1st Order Transients – 5

more complex examples

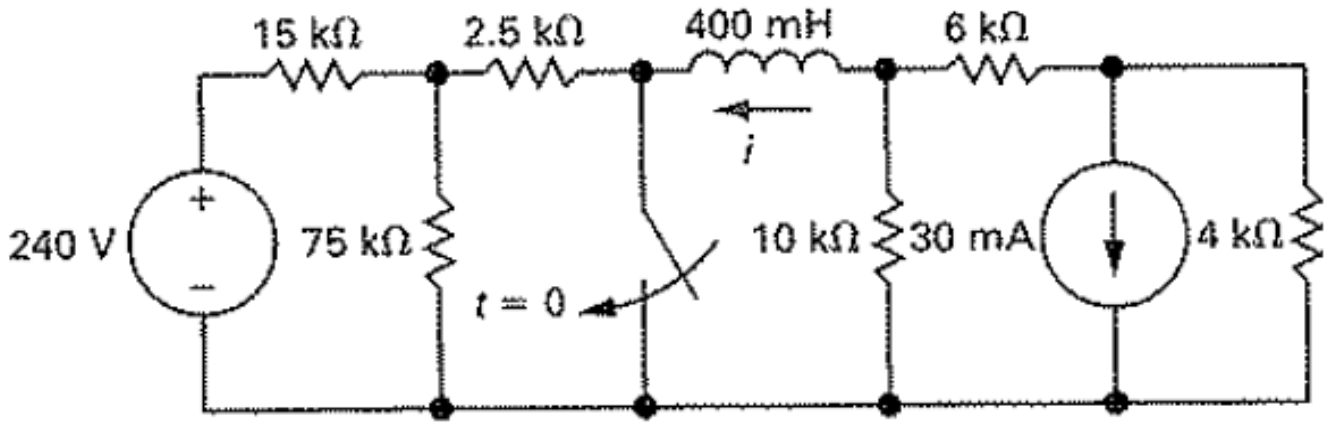
Example: What percentage of the initial energy stored in the capacitor (at time 0) is dissipated in the 4 kΩ resistor by time 250 µsec?



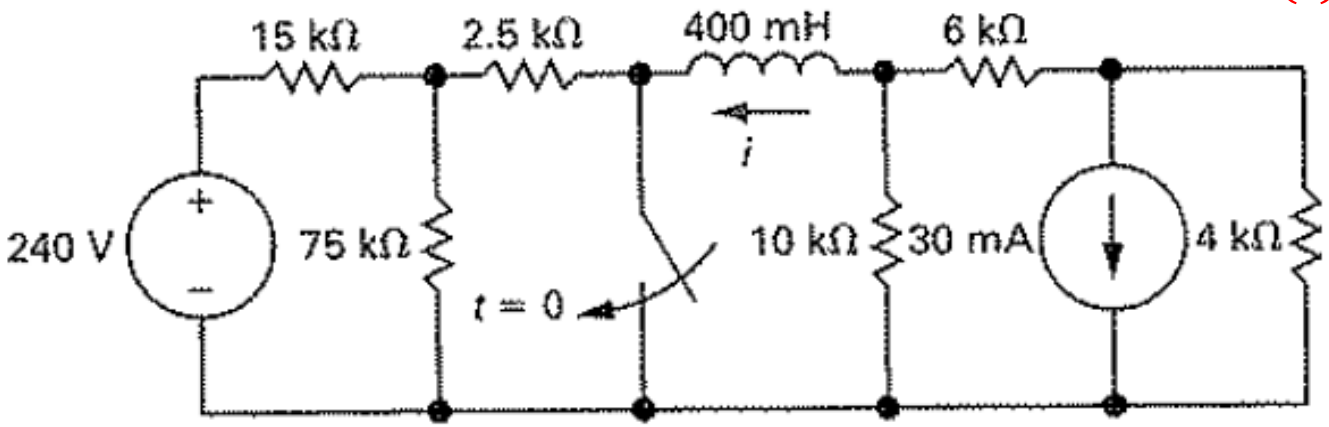
36.8 %



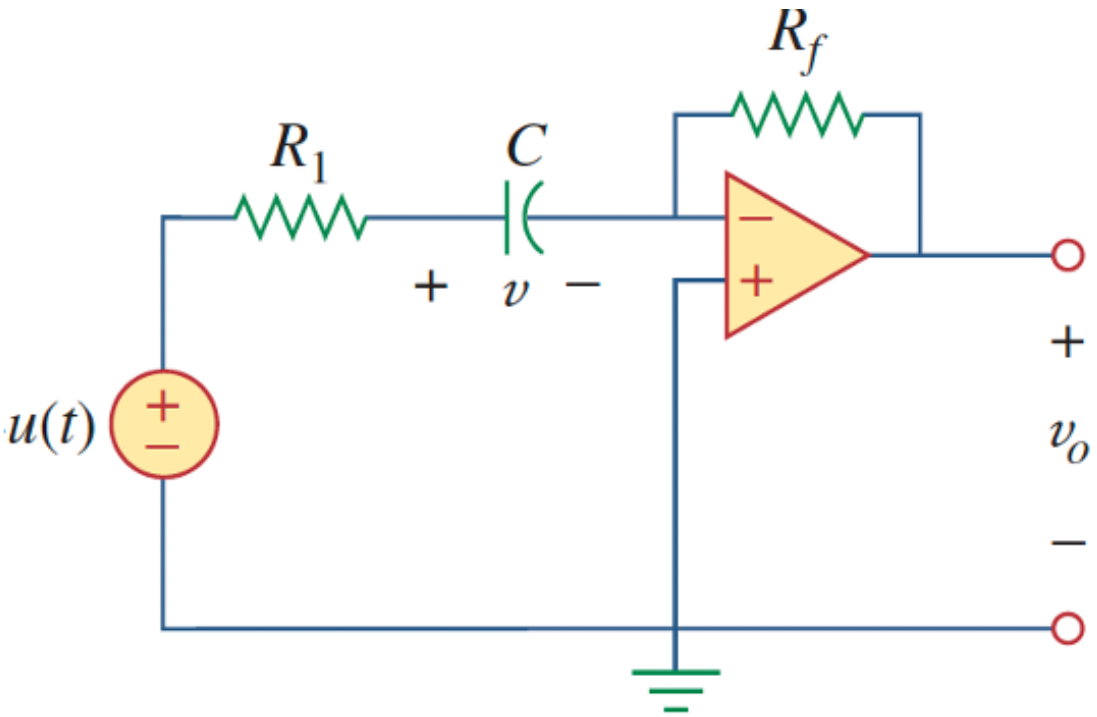
Example: find $i(t)$; this one is a bit tricky

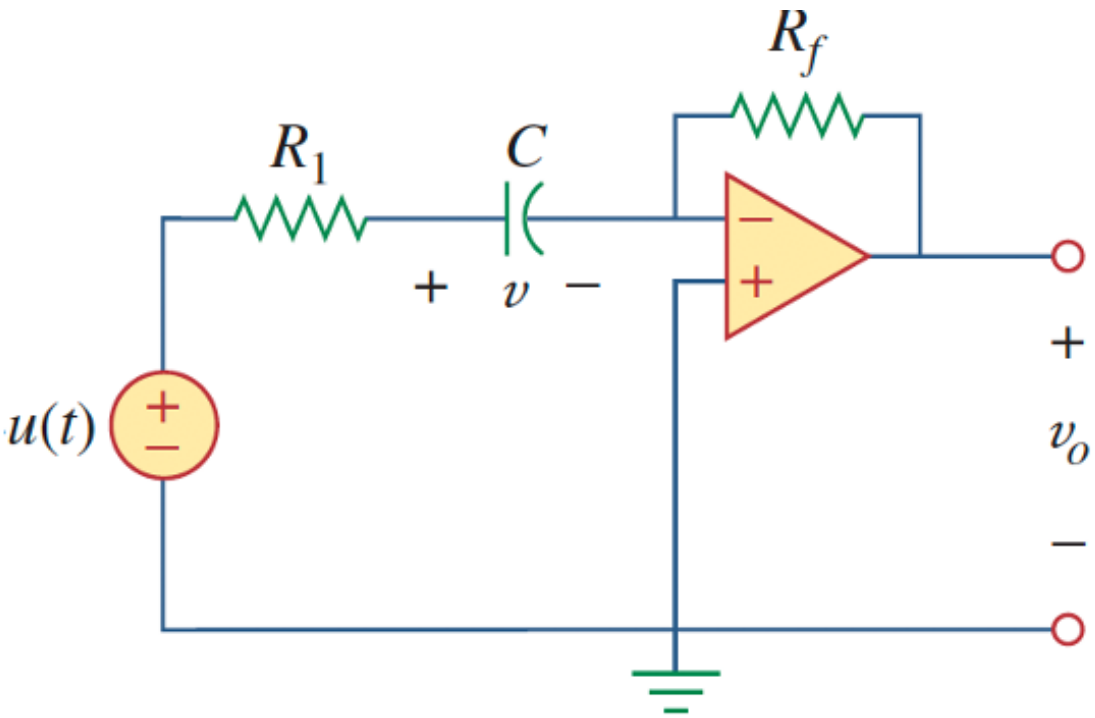


$$i(t) = -e^{12{,}5200t} - 12\ mA$$



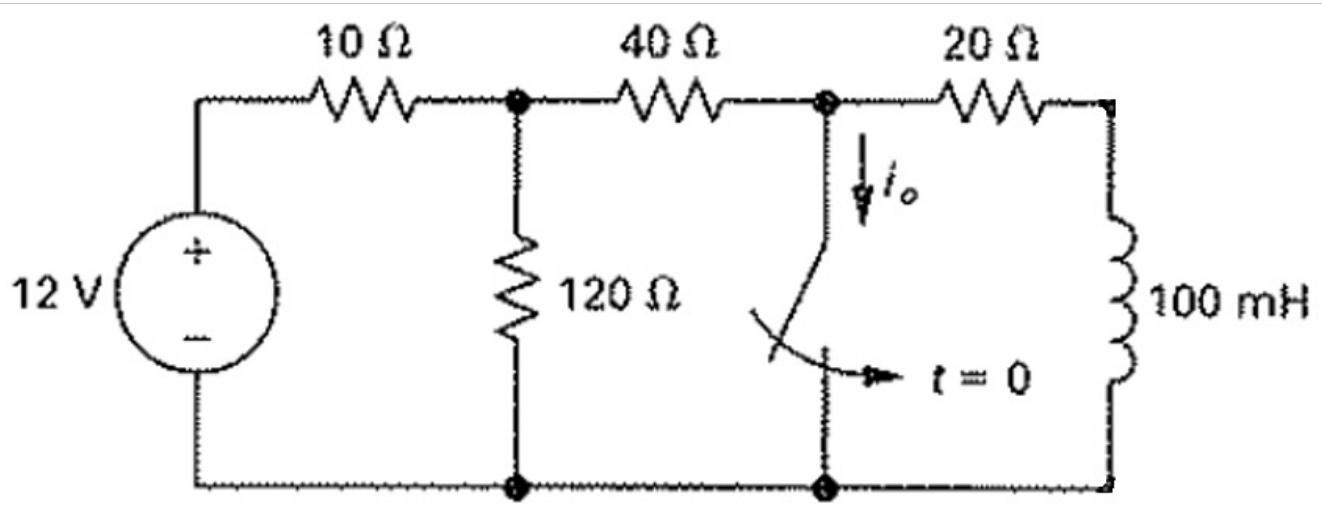
Example: find $v_o(t)$

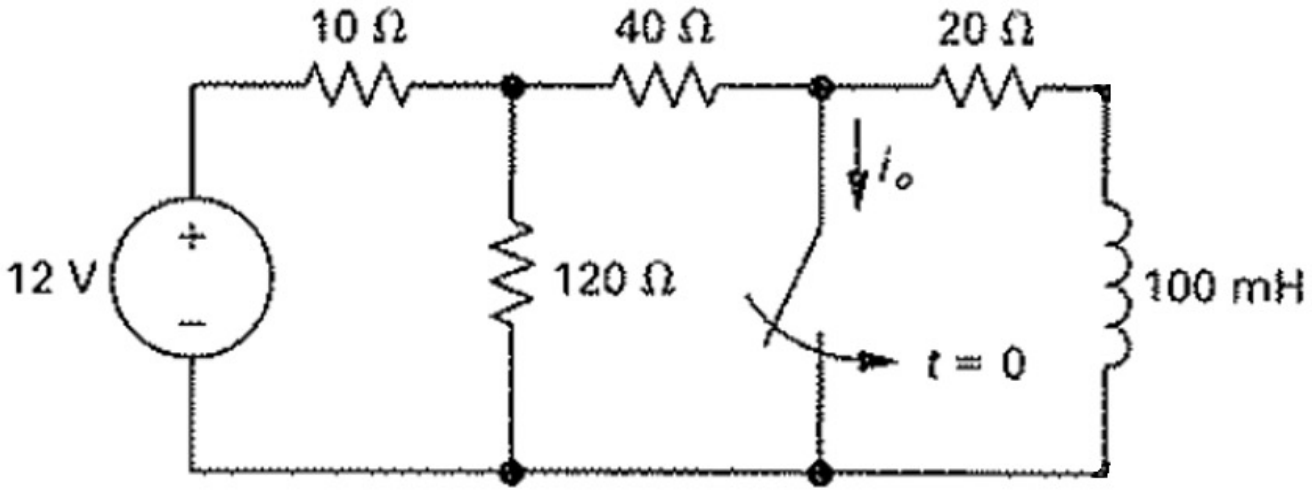




$$v_o(t) = -\frac{R_f}{R_1} e^{-t/R_1 C}$$

Example: find $i_o(t)$





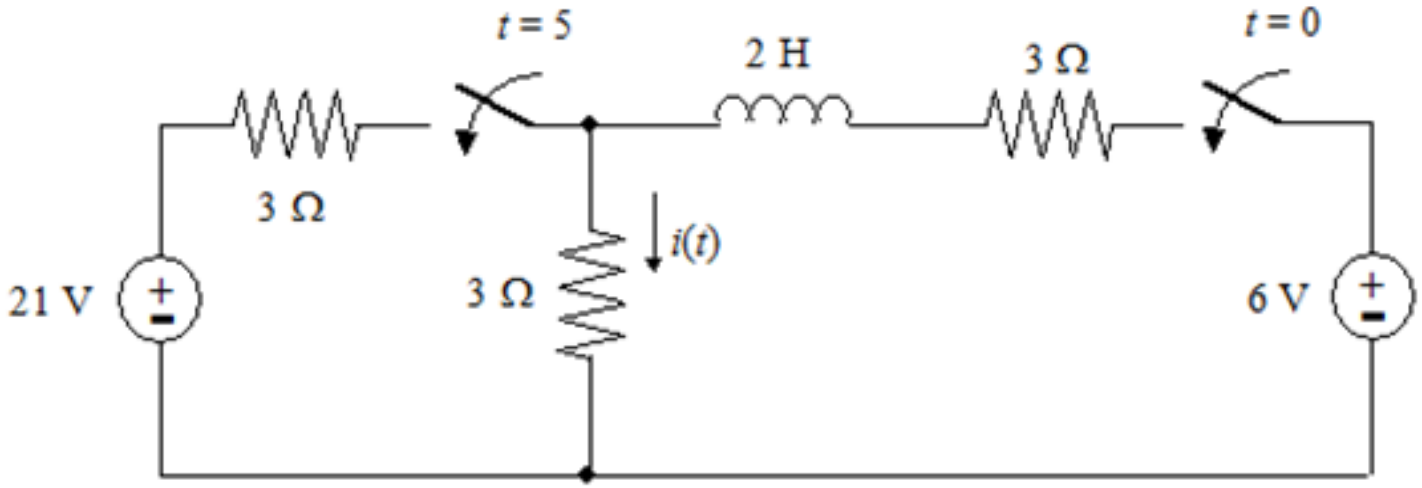
$$i_o(t) = -\frac{8}{50}e^{-200t} + \frac{9}{40}\,\text{A}$$

Practice problem: find $i(t)$

$t < 0$: 0 A

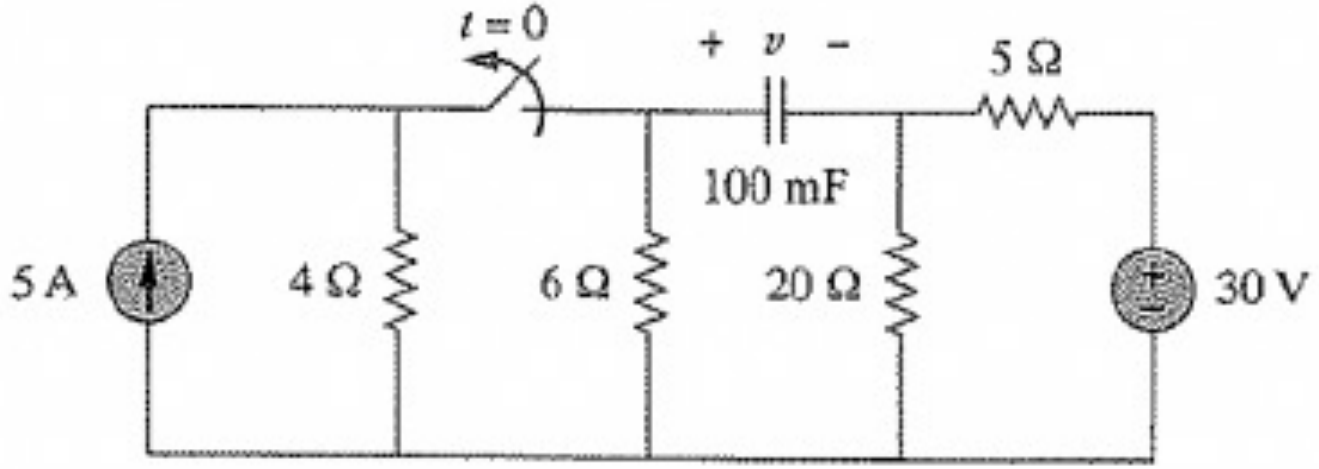
$0 < t < 5$: $-e^{-3t} + 1$ A

$t > 5$: $-2e^{-2.25t} + 3$ A



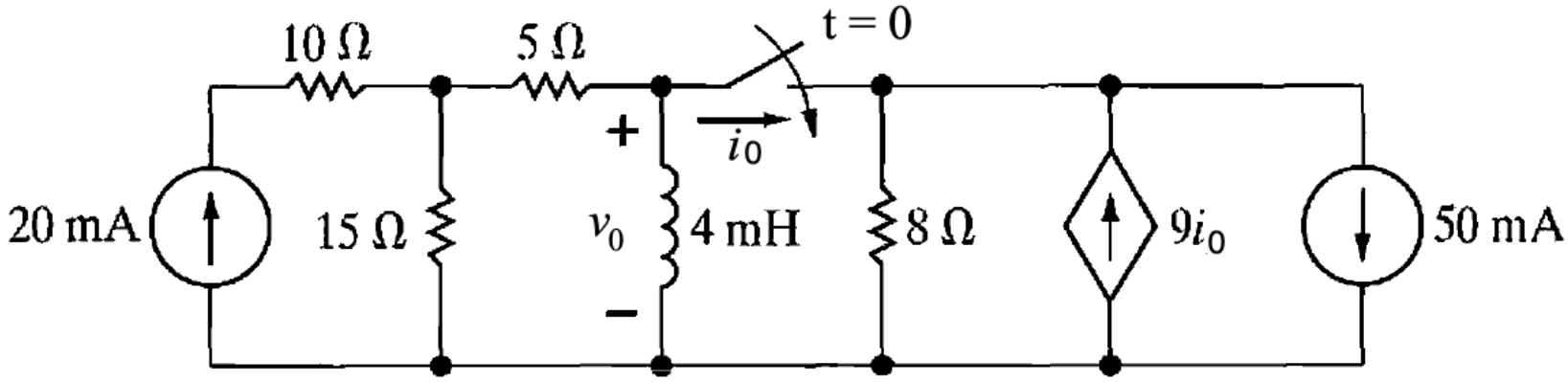
$v(t) = -12e^{-t}\ V$

Practice problem: find $v(t)$, $t > 0$



Practice problem: find $v_o(t), t > 0$

$v_o\ (t) = -16e^{-4000t}\ V$



Practice problem: How much energy is stored in the capacitor at time t = 0? How much of this energy is dissipated by the 12 kΩ resistor by time t = 0.002 seconds? How long does it take to dissipate 95% of the energy?

0.217 mJ
86.5 %
0.003 sec