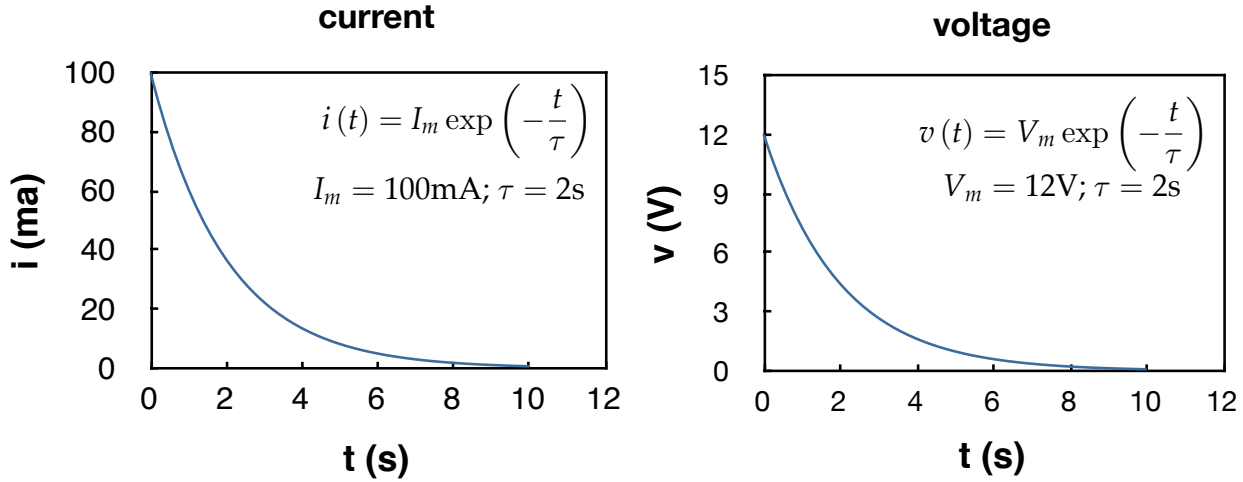Current flows through a circuit element during a short period of time in the form of a current "spike" (a decaying exponential), as shown in the left-hand figure below. The corresponding voltage across the element during the spike is shown in the right figure.

current

$$i\left(t\right) = I_m \exp\left(-\frac{t}{\tau}\right)$$

$$I_m = 100\text{mA}; \tau = 2\text{s}$$

voltage

$$v\left(t\right) = V_m \exp\left(-\frac{t}{\tau}\right)$$

$$V_m = 12\text{V}; \tau = 2\text{s}$$

What is the total amount of charge that flowed during this current spike. How many electrons does this represent?

What is the expression for the power dissipated in the element as a function of time? How much energy was transferred to the circuit element during the spike?

$Q = $ _____   number of electrons = _____

$P(t) = $ _____ $E = $ _____

Write your answers — and whatever work will fit — on this sheet. Staple any sheets with additional work behind.