

Answer on question #59062, Physics / Electric Circuits

Question A series circuit consisting of an uncharged 42 F capacitor and 10M Ω resistor is connected to 100V power source. What are the current in the circuit and the charge on the capacitor after one time constant?

Solution Current changes as

$$I = I_0 e^{-\frac{t}{RC}}$$

In our case $t = \tau = RC$. Hence, current is

$$I = I_0/e = U/(Re) = \frac{100}{10^7 \cdot e} \approx 0.368 \cdot 10^{-5} A$$

The charge will be

$$Q = Q_0(1 - e^{-\frac{t}{RC}}) = Q_0(1 - 1/e) = UC(1 - 0.368) = 100 \cdot 42 \cdot 0.632 = 2654.5 C$$

So answer is 3.7 μ A and 2.7 kC.