

Answer on Question #62672, Physics / Electromagnetism

A series circuit consisting of an uncharged 42F capacitor and 10M ohms 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:

$$I = \frac{U}{R} \left(1 - e^{-\frac{t}{\tau}} \right) = \frac{U}{R} (1 - e^{-1})$$

$$I = \frac{100}{10^7} (1 - e^{-1}) = 6.3 \mu A$$

$$q = C \epsilon \left(1 - e^{-\frac{t}{\tau}} \right) = C (1 - e^{-1})$$

$$q = 42 \cdot 1 \cdot (1 - e^{-1}) = 15.6 C$$

Answer: 6.3 μA and 15.6 C

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