Answer on question #61351, Physics, Electromagnetism

7) A capacitor of 2.0μF is connected to a battery of 2.0V through a resistance of 10kΩ. What is the initial current in the circuit and the current after 0.02s?

a) 0.5μA and 0.074mA
b) 7.4A and 5.0mA
c) 0.2μA and 0.074mA
d) 6.2μA and 7.04mA

Solution:

Current across the capacitor equals:

$$I = \frac{V}{R} \cdot e^{-\frac{t}{RC}}$$

When t= 0 s

$$I = \frac{2.0\ V}{10 \cdot 10^3 \Omega} \cdot e^{-\frac{0.0s}{10 \cdot 10^3 \Omega \times 2.0 \cdot 10^{-6} F}} = 0.2\ mA$$

When t= 0.02 s

$$I = \frac{2.0\ V}{10 \cdot 10^3 \Omega} \cdot e^{-\frac{0.02s}{10 \cdot 10^3 \Omega \times 2.0 \cdot 10^{-6} F}} = 0.074 \cdot 10^{-3} A = 0.074\ mA$$

Answer: 0.2 mA and 0.074 mA

8) A conductor 2cm long carrying a current of 8A lies at right angles to a magnetic field of which the flux density is 1.0T. Calculate the force exerted on the conductor?

a) 0.20N
b) 0.16N
c) 0.25N
d) 0.45N

Solution:

Ampere force module can be found with the formula:

$$F = IBl \cdot sin\alpha$$

where α is the angle between magnetic induction and the direction along which the current flows (we know that α = 90°).

$$F = 8\ A \cdot 1.0T \cdot 0.02\ m \cdot sin90^o = 0.16\ N$$

Answer: 0.16 N