

SAMPLE PROBLEM C

Current

PROBLEM

The current in a light bulb is 0.835 A. How long does it take for a total charge of 1.67 C to pass through the filament of the bulb?

SOLUTION

Given: $\Delta Q = 1.67 \text{ C}$ $I = 0.835 \text{ A}$

Unknown: $\Delta t = ?$

Use the definition of electric current. Rearrange to solve for the time interval.

$$I = \frac{\Delta Q}{\Delta t}$$

$$\Delta t = \frac{\Delta Q}{I}$$

$$\Delta t = \frac{1.67 \text{ C}}{0.835 \text{ A}} = 2.00 \text{ s}$$

PRACTICE C

Current

1. If the current in a wire of a CD player is 5.00 mA, how long would it take for 2.00 C of charge to pass through a cross-sectional area of this wire?
2. In a particular television tube, the beam current is 60.0 μA . How long does it take for 3.75×10^{14} electrons to strike the screen? (Hint: Recall that an electron has a charge of $-1.60 \times 10^{-19} \text{ C}$.)
3. If a metal wire carries a current of 80.0 mA, how long does it take for 3.00×10^{20} electrons to pass a given cross-sectional area of the wire?
4. The compressor on an air conditioner draws 40.0 A when it starts up. If the start-up time is 0.50 s, how much charge passes a cross-sectional area of the circuit in this time?
5. A total charge of 9.0 mC passes through a cross-sectional area of a nichrome wire in 3.5 s.
 - a. What is the current in the wire?
 - b. How many electrons pass through the cross-sectional area in 10.0 s?
 - c. If the number of charges that pass through the cross-sectional area during the given time interval doubles, what is the resulting current?