

Physics: Circuits
Class Examples

Sections Covered

- Chapters 34 and 35

Topics Covered

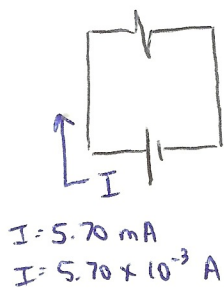
- Basics Circuits (battery, current, resistor)
- Circuit diagrams
- Ohm's Law
- Power
- Series Circuits
- Parallel Circuits
- Combination Circuits
- Capacitors in Circuits
- DC vs. AC Current
- Lab Techniques
 - Reading resistors
 - Using multimeters

Calculating Current:

Example 1:

A battery is charging at a service station and receives a current of 5.70 A for 7.00 hours.

- How much charge passes through the battery?
- What is the number of individual protons/electrons (e) that have passed through the battery in this time?



$$\Delta t = 7.00 \text{ hours} = 25,200 \text{ s}$$

$$\frac{7.00 \text{ hours} \mid 3600 \text{ s}}{1 \text{ hour}} = 25,200 \text{ s}$$

$$A.) \quad I = \frac{|\Delta q|}{\Delta t}$$

$$|\Delta q| = I \cdot \Delta t$$

$$|\Delta q| = (5.70 \times 10^{-3}) \cdot (25,200)$$

$$\boxed{|\Delta q| = 144 \text{ C}}$$

$$B.) \quad |\Delta q| = 144 \text{ C}$$

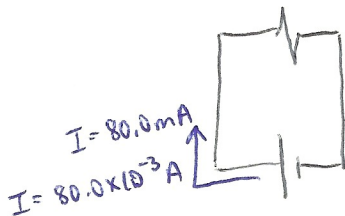
$$q = N \cdot e$$

$$144 = N \cdot (1.60 \times 10^{-19})$$

$$\boxed{N = 9 \times 10^{20} \text{ charges}}$$

Example 2:

If a metal wire carries a current of 80.0 mA, how long does it take for 3.00×10^{20} electrons to pass through a given cross-sectional area of the wire?



$$I = \frac{|\Delta q|}{\Delta t}$$

$$\frac{I}{I} = \frac{|\Delta q|}{\Delta t}$$

$$1 \cdot |\Delta q| = I \cdot \Delta t$$

$$\frac{|\Delta q|}{I} = \frac{I \cdot \Delta t}{I}$$

$$\frac{|\Delta q|}{I} = \Delta t$$

$$\Delta t = \frac{|-48|}{80.0 \times 10^{-3}}$$

$$q = N \cdot e$$

$$q = (3.00 \times 10^{20})(-1.60 \times 10^{-19})$$

$$q = -48 \text{ C}$$

$$\boxed{\Delta t = 600 \text{ s or } 10 \text{ minutes}}$$