

## Honors Physics: Circuits Class Examples

### Sections Covered

- Chapters 22 and 23
- Additional Readings

### Topics Covered

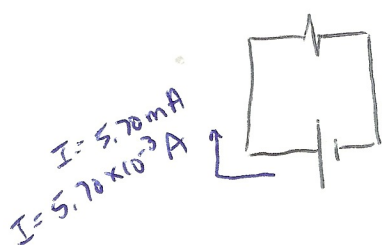
- Basics Circuits (battery, current, resistor)
- Circuit diagrams
- Ohm's Law
- Power
- Series Circuits
- Parallel Circuits
- Combination Circuits
- Capacitors in Circuits
  - Dielectrics
- DC vs. AC Current
- Lab Techniques
  - Reading resistors
  - Using multimeter

### Calculating Current:

#### Example 1:

A battery is charging at a service station and receives a current of 5.70 mA 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?



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

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

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

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

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

$$|\Delta q| = 143.64 \text{ C} \approx 144 \text{ C}$$

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

$$q = N \cdot e$$

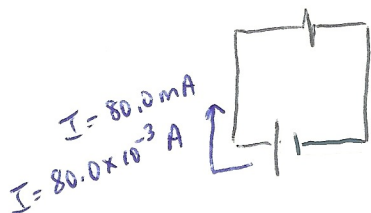
$$144 = N \cdot (1.60 \times 10^{-19})$$

$$N = \frac{144}{1.60 \times 10^{-19}}$$

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

#### Example 2:

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



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

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

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

$$\Delta t = \frac{|-48|}{80 \times 10^{-3}}$$

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

$$q = N \cdot e$$

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

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