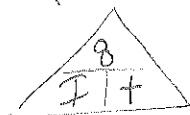


Topic 5B: Current, Resistance, Ohm's Law, Power

Skill 38: Electric Current

Current (represented by "I") is the rate of charge (in coulombs) that pass a point each second. Measured in Amperes A

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



- * If charge is given as electrons (e) convert to Coulombs by $\times \frac{1.6 \times 10^{-19} \text{ C}}{e}$
- Time must be given in seconds

Ex: 1.5×10^{21} electrons passing a point in 3 minutes is a current of

$$I = \frac{q}{t} \quad q = 1.5 \times 10^{21} e \times \frac{1.6 \times 10^{-19} \text{ C}}{1e} = 2.4 \times 10^2 \text{ C} \quad I = \frac{2.4 \times 10^2 \text{ C}}{180 \text{ s}} = 1.33 \text{ C/s} = 1.33 \text{ A}$$

$$t = 3 \text{ min} \times \frac{60 \text{ s}}{1 \text{ min}} = 180 \text{ s}$$

Skill 39: Resistance - the difficulty an electric current experiences as it moves through a circuit

Resistance (R) measured in ohms (Ω)

$$R = \frac{PL}{A} = \frac{\rho L}{\pi r^2}$$

Factors that determine resistance include:

- Length of wire (L) the shorter the wire the easier the path Resistance does the same thing as length
- Type of material - Resistivity (ρ) the greater the resistivity the greater the resistance
Resistivity for each material is listed on PRT for 20°C . Units $\Omega \cdot \text{m}$
- Cross-sectional Area of wire
 - The thinner the wire the greater the difficulty
 - Cross-section of a wire is a circle so area is πr^2
 - Resistance and cross-sectional area have an inverse relationship $R = \frac{\rho L}{A}$
 - Resistance and radius (or diameter) have an inverse square relationship $R = \frac{\rho L}{\pi r^2}$
- Temperature - Not in equation
if temp increases the molecules move faster making it harder

Low Resistance is SHORT, FAT, COLD, GOLD (Metallic)
For any given Voltage as Resistance increases Current decreases

$$I = \frac{V}{R} \text{ (Ohm's Law)}$$