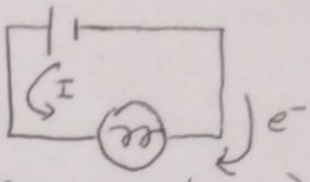
Circuits Worksheet 1

Electric Current : positive (+) charge flow

$I = \frac{\Delta q}{\Delta t}$ (unit: $\frac{C}{s} = A$, amps, amperes)



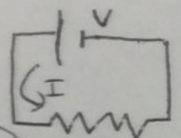
Electrons flow slowly ~ 1 mm/sec. (Similar to marbles in a hose)

1 mm/s is the drift speed, however the signal travels at $c = 3 \times 10^8$ m/s

The random speed of the electrons is 10^6 m/s, but non-linear path.

Ohm's Law: $V = IR$ or $R = V/I$ (unit: $\frac{V}{A} = \Omega$, ohms)

Power (P):



$P = \frac{work}{time} = \frac{voltage}{time} = qV/t = \frac{q}{t}V = IV$

$P = IV = I^2R = V^2/R$

($V = IR$; $I = V/R$)

$R = \rho\left(\frac{L}{A}\right)$ Resistance

(1) Find the max voltage that can be applied across a 250 Ω, ½ W resistor.

(2) With the voltage from the previous problem, how many e^- would flow past the resistor in a minute?

(3) What is the resistance of a 100 W, 120 V bulb?

(4) The voltmeter for the 100 W, 120 V bulb only reads 10 Ω. Why is the calculation different from the reading?

(5) Why do bulbs 'burn out' most often just as they are turned on?

(6) A power station delivers 7000 kW using 110 kV. If the wires have a total of 80 Ω, how much power is wasted in the delivery process?

(7) What percent of the total power is lost to the wires?

(8) What is a kWh? What is it used for?

(9) If you keep a 100 w bulb on for 1 week, how much would it cost to keep on if 1 kWh is $.20?