College Prep Physics II – Video Lecture Notes – Chapter 19
Video Lecture #1
Introduction to Conventional Current and Direct Current & Example Problem

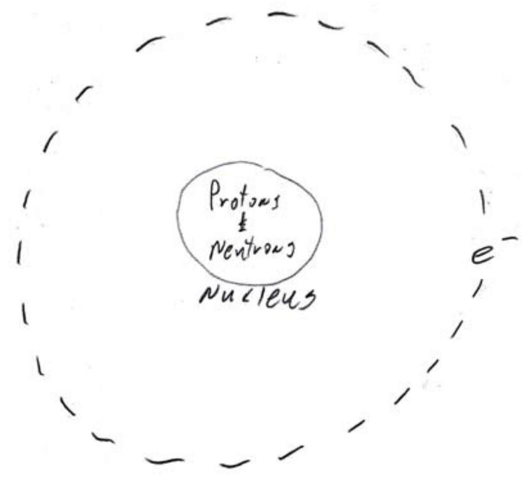
Current, `I`: The movement of charges. The rate at which charges pass by a point in a wire.

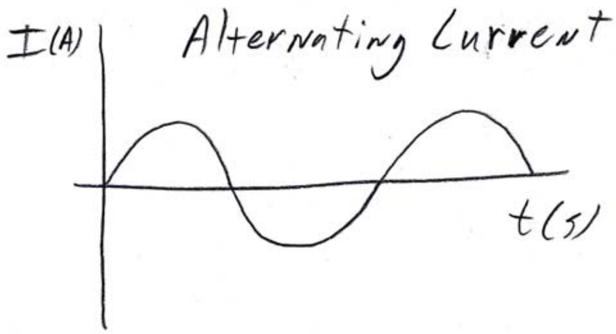
Bohr Model of the Atom: Protons and Neutrons in the nucleus with electrons in orbital shells. Electrons are much easier to remove from the atom; therefore it is generally electrons that flow in wires.

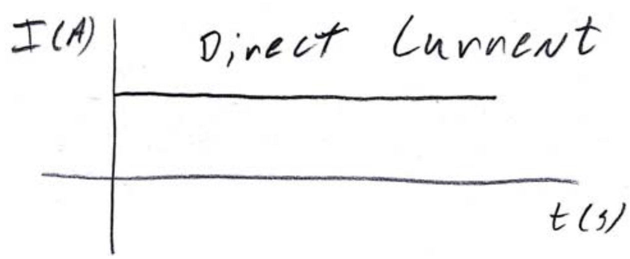
$$I = \frac{\Delta Q}{\Delta t} \Rightarrow \frac{Coulombs}{second} = \frac{C}{s} \Rightarrow Amperes, Amps, A$$

(Base SI Dimension)

Conventional Current: The direction that positive charges <u>would</u> flow. The reality is that negative charges flow in a negative direction.







Alternating Current, AC: Direction and magnitude of the current changes. Has a frequency like a sine or cosine wave. Less power loss over distance.

Direct Current, DC: Direction and magnitude of the current is constant. Large power loss over distance.

Many electronic devices have an AC/DC power converter to convert the alternating current that comes to your house to direct current. That is what the “brick” attached to your electronic devices is for.

Example Problem: A charge of 13.0 mC passes through a cross-section of wire in 4.5 seconds. (a) What is the current on the wire? (b) How many electrons pass through the wire in this time?

$\Delta Q = 13.0mC \times \frac{1C}{1000mC} = 0.013C$; $\Delta t = 4.5s$; a) `I` = ? b) # of electrons = ?

a) $I = \frac{\Delta Q}{\Delta t} = \frac{0.013}{4.5} = 0.002\overline{8}\,A \approx \boxed{0.0029A = 2.9mA}$

b) $Q = ne \Rightarrow n = \frac{Q}{e} = \frac{0.013}{1.6 \times 10^{-19}} = 8.125 \times 10^{16} e^- \approx \boxed{8.1 \times 10^{16} e^-}$

$n \approx 81 \times 10^{15} e^- = 81 Pe^- = 81{,}000{,}000{,}000{,}000{,}000\, e^-$ (That is a lot of electrons, eh?)