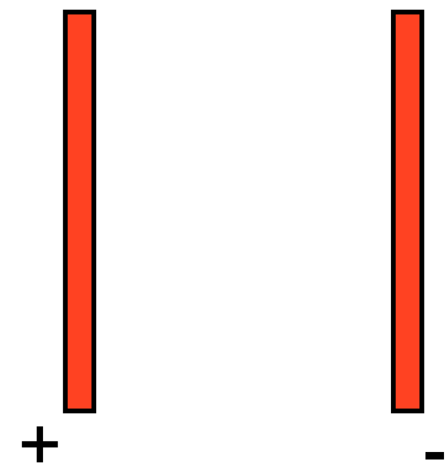
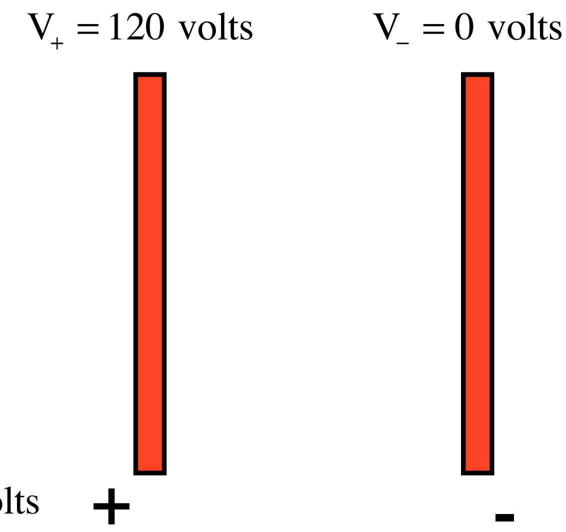
Extra 1:

a.) What's the speed of an electron accelerated through 120 volts?



b.) What's the speed of a proton accelerated through 120 volts?



Extra 1:

a.) What's the speed of an electron accelerated through 120 volts?

This is a classic conservation of energy problem. It is ALWAYS best to identify voltage values (or, at least, symbols) before starting . As such, we will assume that the electrical potential of the high voltage side is $V_+ = 120 \text{ volts}$ and the electrical potential of the low voltage side is ZERO. Remembering that the charge of an electron is negative and that to accelerate, it must start at the negative plate, we can write:

$$\sum KE_1 + \sum U_{\text{in system at time 1}} + \sum W_{ext} = \sum KE_2 + \sum U_{\text{in system at time 2}}$$

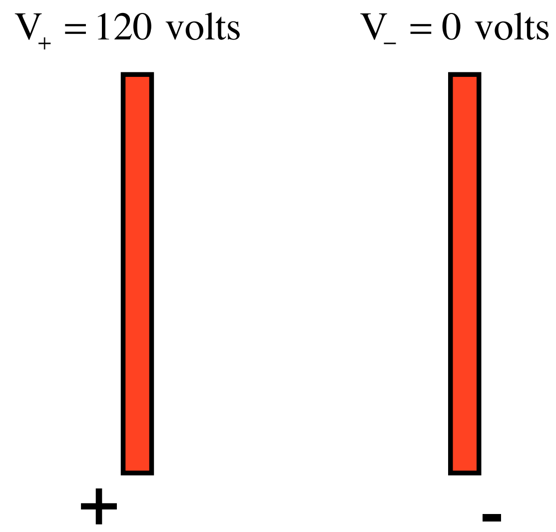
$$\Rightarrow \quad 0 \quad + \quad (-q)V_- \quad + \quad 0 \quad = \quad \frac{1}{2} m_{e^-} v^2 \quad + \quad (-q)V_+$$

$$\Rightarrow \quad 0 \quad + \quad (-1.6\text{x}10^{-19})(0) \quad + \quad 0 \quad = \frac{1}{2}\left(9.1\text{x}10^{-31}\right)v^2 + \left(-1.6\text{x}10^{-19}\right)(120)$$

$$\Rightarrow \quad v = \text{whatever}$$

Extra 1:

b.) What's the speed of a proton accelerated through 120 volts?



The differences between this and the previous problem is that protons will accelerate from the positive to the negative plates (so the "initial" positions will be reversed), the charge being accelerated will be positive and the mass will be that of a proton. Putting it all together yields:

$$\sum KE_1 + \sum U_{\text{in system at time 1}} + \sum W_{ext} = \sum KE_2 + \sum U_{\text{in system at time 2}}$$

$$\Rightarrow 0 + (q)V_+ + 0 = \frac{1}{2} m_{p^+} v^2 + (q)V_-$$

$$\Rightarrow 0 + (1.6x10^{-19})(120) + 0 = \frac{1}{2}(1.67x10^{-27})v^2 + (1.6x10^{-19})(0)$$

$$\Rightarrow v = \text{whatever}$$