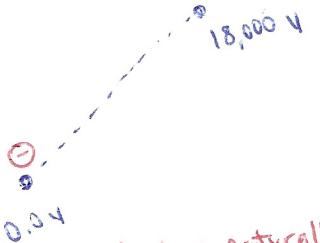
Honors Physics: Electric Field and Electric Potential
Class Examples

Mass of a proton = 1.67×10^{-27} kg
Mass of an electron = 9.11×10^{-31} kg

Electric Potential Difference – A little practice

A. An electron in an old tv set (before flat-screen plasmas) passed through a potential different of 18,000 v.
   a. What is the change in electric potential energy for this electron?
   b. Explain the sign of your answer from part a.



* An electron naturally moving from a low to high electric potential.

a) $\Delta V = \frac{\Delta EPE}{q}$

$\Delta EPE = \Delta V \cdot q$

$\Delta EPE = (18{,}000 - 0)(-1.60 \times 10^{-19})$

$\Delta EPE = -2.88 \times 10^{-15}$ J

b.) There is a loss of electric potential energy because the electron is moving naturally. Therefore electric potential energy is being transformed into kinetic energy as the electron moves.

B. A positive charge of 3.00 μC gains 4.50×10^{-4} J of electric potential energy.
   a. How is this object moving, high to low or low to high?
   b. Through what electric potential difference was this charge moved?

a.) If a positive charge gains electric potential energy - it is moving against its will. They normally move from high to low electric potentials - so it must be moving low to high.

b.) $\Delta V = \frac{\Delta EPE}{q}$

$\Delta V = \frac{4.50 \times 10^{-4}}{3.00 \times 10^{-6}}$

$\Delta V = 150$ V

C. An electric field has a magnitude of 4.50×10^5 N/C. How much work is done to move a proton 25.0 cm through the field? *Consider older formulas for work.

* Blast from the past

$W = F \cdot d \cdot \cos\theta$

* Assume $\cos\theta = \cos 0^\circ = 1$

* $d = 25\text{cm} = 0.25\text{m}$

$E = \frac{F}{|q|}$

$F = E \cdot |q|$

$F = (4.50 \times 10^5) \cdot |+1.60 \times 10^{-19}|$

$F = 7.20 \times 10^{-14}$ N

$W = F \cdot d$

$W = (7.20 \times 10^{-14})(0.25)$

$W = 1.8 \times 10^{-14}$ J